Supplement to

THE MEDICAL JOURNAL OF AUSTRALIA

No. 6. SATURDAY, SEPTEMBER 17, 1927. SYDNEY.

Transactions of the Australasian Medical Congress
(British Medical Association)

Second Session: Dunedin, February 3 to 10, 1927

Transactions of the Australasian Medical Congress
(British Medical Association)

Second Session: Dunedin, February 3 to 10, 1927

No. 6. SATURDAY, SEPTEMBER 17, 1927. SYDNEY.

MONDAY MORNING, FEBRUARY 7, 1927.

COMBINED MEETING.—SECTION I. AND V.

DIET.

By ELIZABETH GUNN, M.B., B.S. (Edinburgh),
Wanganui, New Zealand.

(*Continued from page* 160.)

In many homes general diet consists of white bread, patent cereal foods, too many potatoes, few vegetables, white sugar, meat (often cooked two or three times), white flour, tinned foods, biscuits and tea. The diet consists of from 1,500 to 2,000 (liberal allowance) calories and is lacking in vitamins. In camp I give some 2,850 to 3,000 calories.

One-fifth to one-seventh of the expenditure on food is on bread and flour and these form by far the largest part of the diet of most growing children.

There is great ignorance of economic value of foods and an increasing demand for overcooked and highly seasoned dishes, take for example cereals. Oatmeal, as the natural food of Scotland and therefore of Dunedin, has produced in past years a magnificent type of man and woman famed for their physique and hardiness.

Coarse oatmeal and bran, four parts of oatmeal, one part of bran, with a mug of milk and no sugar—accidental—is only breakfast in camp. Six or eight raisins, a banana, some prunes or dates are often given with second or third helpings. There is no child after first three or four days, who does not eat and enjoy it, and yet at every camp there are some forty to fifty children who say they cannot eat porridge and have all known excuses; it gives them spots, makes them sick, overheats them, but on being told that is all right, they will get a good dinner at twelve, they are willing to try a little porridge.

Oatmeal in many homes is being ousted by the much advertised and more expensive cereals.

A great part of excessive calories in camp is supplied by milk. I have found that these malnourished children require frequent meals. I tried three meals a day without success. If they get up, get dressed and washed and run around (as they always will) they are overtired and disagreeable; they do not want to eat any breakfast. In camp *reveille* is at 6.30 a.m. (5.30 a.m. ordinary time) and they get a cup of cocoa at 6.40 a.m., which they take slowly.

They go to bed at 7.30 p.m. camp time (6.30 p.m. actual time) and soon sleep the greater part of this time.

As well as this feeding it must not be forgotten that these children are living in the open air in tents and marquees, resting in the open for one and a half hours after the midday meal.

The last camp was in November and December, 1926. It was awful weather, raining and cold; mud was everywhere. I would have liked to have given up camp, but knew that the weather would be beautiful as soon as I did, so I hung on. No child was ill. All improved in health and increased in weight.

I had four cases of mumps within the first week of camp. The patients were isolated more or less, chiefly less. There was one case of measles, one of chicken-pox; I covered the patients with eucalyptus and olive oil. No fresh cases occurred. The only thing I was particular about was they kept their own utensils.

I kept them in camp to prevent a spread of infection in their own homes, but especially to prevent any alarm among parents resulting in a breaking up of camp.

Twenty children were given daily 0·6 to 1·2 mils (ten to twenty minims) of cod liver oil labelled and called in camp "Best Sardine Oil." Everyone wanted some. They were given the oil, a piece of brown bread and enjoyed it. I cannot say that these children improved more than the others.

Out of these 550 children I have had some thirty-two children classified in school as mentally backward, all much below average weight for height and age, all a great deal of trouble in camp. I had a special label put on them and it was everybody's work to look after them. Great improvement took place in their general health and weight and in their mental condition. Eleven whom I have special opportunity of following up, are no longer classed as mentally backward, but are up to their average age in class work.

In a large school I had astonishing results with a milk class. Of 180 children fifty of the poorer

specimens physically were picked and 300 cubic centimetres (half a pint) of milk and wheatmeal biscuit given at 10 a.m. and then twenty minutes' rest greatly increased their weight and improved their general health.

DIET AS A CAUSE OF SEPSIS IN THE ALIMENTARY CANAL.

By H. P. PICKERILL, C.B.E., M.D., M.S.,
Dean of the Dental Faculty, Professor of Dentistry, University of Otago.

THROUGHOUT the body the chief resistance to invasion of the tissues by organisms is vested in their epithelial coverings. Once the epithelial protection is breached, the entrance of organisms and the occurrence of a lesion more or less severe is under ordinary conditions certain. There are locations at which the epithelial covering is more likely to be destroyed than others and amongst these are the teeth whose outer covering, the enamel, is a completely calcified epithelium. The destruction of this calcified epithelium is brought about by the acid fermentation of carbohydrates which are allowed to stagnate in proximity to it. The chief acid formed is lactic acid according to the following approximate equations; the acid being in a nascent condition, must combine with the most readily available base and this usually is the lime salts of the enamel resulting in the disintegration of the latter.

Monosaccharides:

$C_6H_{12}O_6$ (glucose) = $2C_3H_6O_3$ (lactic acid).

Disaccharides:

$C_{12}H_{22}O_{11} + H_2O$ (cane sugar)
= $C_6H_{12}O_6$ (dextrose) + $C_6H_{12}O_6$ (lævulose).

$C_6H_{12}O_6 = 2(C_3H_6O_3)$ (lactic acid).

Polysaccharides:

$(C_6H_{10}O_5)^n$ (starch) + H_2O
= $C_6H_{10}O_5$ (dextrin) + $C_{12}H_{22}O_{11}$ (maltose).

$C_{12}H_{22}O_{11} + H_2O = 2(C_6H_{12}O_6)$.

$2(C_6H_{12}O_6) = 4(C_3H_6O_3)$ (lactic acid).

$2(C_3H_6O_3) = C_4H_8O_2 + 2CO_2 + 2H_2$
(butyric acid).

All carbohydrates are not equally fermentable by mouth organisms. The following table gives the comparative acid forming potential of various common articles of diet when stagnating in the mouth (see Figure I.).

Two things will be observed: (i.) Those articles of diet which are most highly prepared, cooked, refined and ground, produce most acid, (ii.) those articles which are more in their "natural" state, produce less or none at all, the more sapid these articles are, the less acid is formed.

The epithelial covering of the teeth being breached, septic organisms gain an entrance to the dentine, pulp and jaw tissues and then inevitably, if not treated, set up chronic suppurative processes including the now familiar "focal infection" areas so commonly seen in skiagrams. I am of the opinion that the destruction of dentine by organisms is also to be regarded as a septic process, albeit there is no

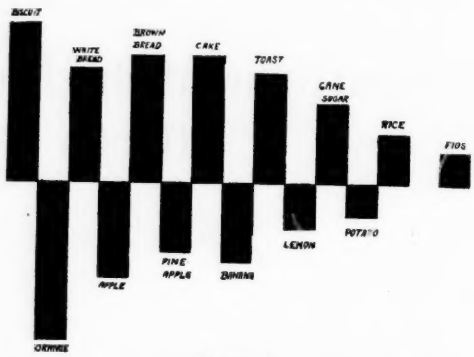

Figure I.

Chart compiled from a large number of estimations showing comparative amounts of acid produced (columns above the line) by fermentation of *débris* remaining in the mouth after mastication. The columns below the line represent the comparative amount of alkaline end products resulting from similar estimations. The substances above the line are said to have an "acid potential" and those below to have an "alkaline potential."

pus present. Dentine is, one-third of it, composed of soft, sentient, living tissue and in its proteolysis by organisms the same toxic end-products must be formed and absorbed by the patient as in the destruction of bone.

Apart therefore from the defective resistance of enamel to the action of acids (which is too large a subject to enter into here) the stagnation of these particular carbohydrates which form so large a part of modern dietaries, may be regarded as the starting point of a vast amount of oral sepsis.

These carbohydrates stagnate largely because of deficient oral circulation; in other words their non-sapid character fails to stimulate sufficiently the glosso-pharyngeal nerve endings in the tongue and so an inadequate flow of salivary secretion is produced either to wash away the *débris* or to neutralize rapidly any lactic acid formed. That this is so is demonstrated by the following graph which represents the "alkalinity-index" of saliva (that is the production of alkaline salts per minute as estimated by its power to neutralize one-fiftieth normal sulphuric acid, methyl orange being used as the indicator). This graph represents the average of a very large number of estimations of saliva collected during mastication from the parotid, submaxillary and sublingual glands at the same time (see Figure II.).

It will be observed that those substances containing most organic acids produce the highest alkalinity index and therefore most protection against nascent lactic acid.

It will also be noted conversely that those articles which produce least protection, are precisely those which are taken in the largest quantities by ordinary individuals and especially children nowadays. It is further most important to notice that these latter articles of diet are precisely those which were shown above to be capable of producing most fermentation acid. Modern dietaries, especially children's, are becoming non-stimulating in character. Parents are horrified at their children eating

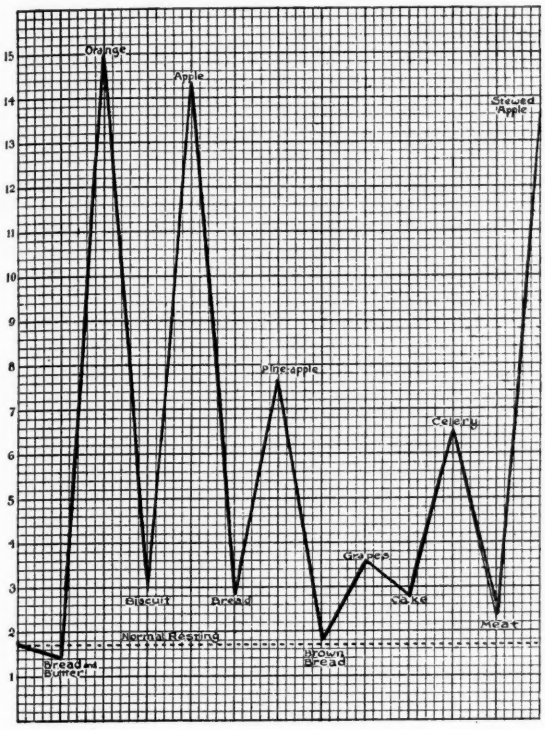

Figure II.

Graph showing the variations in the alkalinity index of saliva when different substances are eaten. This graph demonstrates vividly the extreme delicacy of the glosso-pharyngeal-*chorda tympani* reflex mechanism.

something which they fear will give them "stomach-ache" because they know that they themselves could not digest it, an absolute *non sequitur*.

The results of my investigations into salivary secretion have been recently critizised adversely in America by certain individuals who state and give figures to show that my claims cannot be substantiated. I would point out, however, that all the American investigations fail on two most vital points: (i.) They have taken no account whatever of rate of flow, but have merely estimated percentage compositions; (ii.) saliva has not been collected during mastication. In the absence of these two fundamental principles, these criticisms can be regarded as negligible.

Nature evolved the glosso-pharyngeal nerve for very definite and important purposes, not merely to give pleasure to the glutton, but as the afferent branch of the reflex arcs of salivary and alimentary secretion, and these secretions, may I point out, serve the dual purpose of digestion and protection. Without taste we get very diminished salivary and gastric secretion and therefore stagnation in both cavities and stagnation practically always means infection. The importance of taste in relation to gastric secretion is borne out by the work of Lobasov, as epitomized in the following table.

Therefore without glosso-pharyngeal stimulation (taste) digestion is only one-fifth what it should be. These facts are further corroborated by the work

TABLE I.

GASTRIC SECRETION IN AN ŒSOPHAGOTOMIZED AND GASTROTOMIZED DOG.

Time During Which the Food is Digested.	Food Introduced Directly into Stomach. No Glosso-pharyngeal Reflex. No Taste. (Amount digested.)	Animal Allowed to Taste Food (Glosso-pharyngeal Stimulated) for Eight Minutes Only. Food Allowed to Pass into Stomach. (Amount digested.)
2 hours	6·5%	31·6%

of Pavlov, Edkins and Starling by observations of gastric secretion in a "miniature" stomach when food is introduced into the large stomach.

In order to eliminate any stimuli other than those caused by the presence of foods in the stomach, a Pavlov's miniature stomach and a gastrostomy were prepared in the animal; the various foodstuffs were then introduced directly into the stomach without attracting the dog's attention and the secretion collected from the miniature stomach which is about one-twelfth of the normal stomach.

Two somewhat surprising results followed: first, the entire absence of secretion to some articles of common daily consumption and secondly, the remarkable similarity of response to given stimuli between the gastric and the salivary glands. The following table illustrates the observed effects:

TABLE II.

Substance Introduced.	Amount of Gastric Secretion.
Bread	Nil.
Water	Some (Pavlov); none (Edkins).
Sodium bicarbonte	Complete inhibition.
Acids	Increase, especially after meals (Starling).
Phosphoric, Butyric	Increase.
Hydrochloric	No more than from water.
Sodium chloride	No more than from water.
Saliva	Definite increase (Pavlov).
Egg-white	None for over an hour.
Minced meat	Considerable secretion.
Fats	Depression for three to four hours.

Tested in this manner, we see that contrary to usual statements gastric secretion is stimulated by acids and inhibited by alkalis and that in this respect it is quite analogous to salivary secretion; further, such articles as bread, water and fats are depressants of secretion in the second digestive cavity, just as they were found to be in the first.

Pancreatic Secretion.

Pancreatic secretion, when tested by similar experiments, gives precisely similar results, that is the animal has a pancreatic fistula and a gastrostomy, food is introduced directly into the stomach and the pancreatic secretion observed. The following table illustrates the effects on the secretion produced by various substances:

TABLE III.

Substance Introduced into Stomach.	Effect on Pancreatic Secretion.
Water	Nil in thirty minutes (Dolinski); 9·4 c.cm. (average) in thirty minutes (Becker).
Acids—	
Hydrochloric	30 to 40 c.cm. in thirty minutes.
Phosphoric	
Citric	
Acetic	
Alkalis—	
Sodium carbonate	Decrease, passing to complete inhibition.
Lime water	
Sugars	Only caused secretion when they had been given a strong acid reaction. If they were neutral or alkaline, no secretion resulted.
Egg-white	
Peptone	
Fats	Marked secretion from the action of secretion already formed.

Again the outstanding feature is stimulation by acids and depression by alkalis. It is well known that an acid is necessary to combine with the prosecretin to form the hormone which is one of the chief stimulants to pancreatic secretions; if, however, foods are taken which stimulate neither oral nor gastric secretion, and which therefore are not acid in themselves, the pancreatic secretion will also fail for want of hydrochloric acid to unite with the prosecretin.

Biliary Secretion.

Biliary secretion by the liver cells is almost analogous to the foregoing, as may be seen in the following table:

TABLE IV.

Substance Introduced into Stomach.	Biliary Secretion.
Purely carbohydrate diet	"Insignificant."
Acids	"Increased" secretion.
Meat diet	Increase of secrtion.
Fat	Less secretion.

The bile may be secreted, but not discharged from the gall bladder into the duodenum. This discharge has been found to be best promoted by the stimulus derived from the products of active gastric digestion; so that again it is clear that if gastric digestion be feeble (bread, water, alkalis *et cetera*), the biliary discharge also will be impaired.

We therefore see with regard to these four primary digestive secretions, salivary, gastric, pancreatic and biliary, that in general terms their stimulants and depressants are identical in nature.

The general stagnating and therefore sepsis-producing effects of a non-stimulating diet can now be more accurately visualized.

What happens with complete gastric stagnation is well known from the experiment of dividing the vagus in the dog below the diaphragm. The stomach dilates, the food remains in the stomach undigested, it ferments, decomposes and the dog dies of sapræmia. I have produced an identical effect in a sheep by dividing the glosso-pharyngeal, that is the afferent instead of the efferent track of the digestive-protective arc and I suggest that a similar, though milder but more prolonged, effect is produced in the human subject by the partial blocking of the afferent side of the arc at its point of origin.

I have also experimented with rats in the same direction, namely to obtain the total elimination of afferent taste stimuli. This was done by removing completely with the electric cautery the mucous membrane of the tongue. In every case the animal subsequently died of starvation, because it would not eat, tempt it how we would. I do not think refusal to eat was due to pain, as judged by the general behaviour of the animals, but was due to complete and acute anorexia.

This blocking or diminished taste perception is brought about clinically in two ways which are, however, intimately associated: firstly, by an habitual diet of a non-stimulating character and secondly, by the formation of a coating on the surface of the tongue which protects or buries the terminations of the glosso-pharyngeal and lingual nerves and prevents their being stimulated as they should be by food in the mouth.

Results of a Diet of a Non-Stimulating Character.

From the foregoing remarks it is obvious that alkalis may be taken as types of non-stimulating, if not absolutely inhibitory, substances. To test the effect of continual depression of the secretions by this means, I have fed rabbits for some three or four years on boiled and neutralized food (sodium carbonate being used). The results are remarkable and so far as I know had not before been observed The series of experiments is not complete and I am unable here to give all the details; it will suffice for the present purpose to summarize the effects which are as follows:

1. If such feeding be commenced early enough in life, the animal always dies within six months.

2. Development is markedly retarded, the animals being only from one-quarter to one-half the weight of the controls of similar age.

3. Starch and calcium are excreted in excess in the fæces.

4. The salivary glands do not develope in the normal ratio to the rest of the body (lack of taste-reflex).

5. At the *post mortem* examination there are practically always gastric lesions, sometimes ulcers, sometimes acute general gastritis, always marked dilatation and sometimes pyloric stenosis.

The above forms a clinical picture which, I believe, corresponds to the chronic form of a "disease" of which division of the vagi represents the acute form.

These results are, it seems to me, significant in view of the large consumption of alkalis at the present day, both in the form of drugs and in food. There exists, I think, a very serious alkali drug habit; people dose themselves with bismuth and sodium carbonate or "anti-acids" almost *ad libitum* for "indigestion"; the amount of alkali in the form of tooth powders and pastes, partially consumed and

used locally to the depression of the oral nerve-endings, must be prodigious; and the amount of sodium carbonate consumed in artificialized foods and drinks must likewise be very considerable indeed.

In some cases alkalis are, of course, necessary and do a considerable amount of good. They exert this beneficial action by resting over strained or acutely inflamed digestive organs. In the same way a splint may rest a limb or digitalis the heart, but neither can be continued indefinitely without harm resulting.

Artificial Elimination of Gustatory Stimuli.

Rabbits were anæsthetized (with chloroform) and various portions of the mucous membrane and subjacent tissue of one side of the tongue were removed with the electric cautery. After the lapse of a few months the weight of the glands on either side was compared. The left side of the tongue was always selected, since Bidder and Haidenhain found that, in the dog, at least, the left submaxillary glands are as a rule larger than the right.

(*a*) A full-grown wild rabbit (weight 1,140 grammes) was anæsthetized and the whole of the mucous membrane and the submucous tissue of the left side of the tongue was removed with the electric cautery. The rabbit made a good recovery and was fed on ordinary fresh food for a period of two months. It was then killed and the glands removed and weighed, with results as shown in the following table:

TABLE V.

Weight of Right Gland.	Weight of Left Gland.	Weight of Rabbit.
0·558 gramme .. .. or 0·481 gramme	0·4300 gramme 0·3793 gramme	1,160 grammes. Expressed as per kilogram of body weight.

Thus it is seen that at the end of two months the gland receiving its stimulus from the side of the lesion was appreciably less in weight than that on the normal side, the diminution being one of 0·1017 gramme per kilogram of body weight.

(*b*) Another full-grown wild rabbit, weighing 1,299 grammes, had the mucous membrane removed from the anterior two-thirds of the left side of the tongue in a similar manner. It was fed on precisely similar food to the other rabbit and was kept for the same length of time (two months). The following were then the weights of the glands:

TABLE VI.

Weight of Right Gland.	Weight of Left Gland.	Weight of Rabbit.
0·5210 gramme .. or 0·4111 gramme ..	0·4762 gramme 0·3670 gramme	1,270 grammes. Expressed as per kilogram of body weight.

Here again is a distinct difference between the two glands, the diminution in this case amounting to 0·0441 gramme per kilogram of body weight or a little less than half the diminution observed when the whole of the mucous membrane was removed. If any inference could be drawn from this, it would be that the stimulation arising from the excitation of the glosso-pharyngeal nerve is of somewhat greater importance than that from the lingual nerve.

It may be concluded, therefore, that in animals a diminution in the excitation of the gustatory nerves leads to a loss of weight in the salivary glands and presumably also to a corresponding loss of function.

Diminished Taste Perception in the Human Subject.

It would seem not to be wrong to infer that the habitual consumption of substances which fail to stimulate the endings of the lingual and glosso-pharyngeal nerves in the tongue, especially during the years of development, would lead to their becoming less excitable or dulled in their appreciation of the different taste stimuli.

Assuming, then, for the present that this does take place, the following experiments were done to determine what the effect would be on salivary secretion. The condition of dulled taste-appreciation was artificially produced by painting various parts of the tongue with cocaine. Naturally this at first produced a profuse flow, owing to its bitter taste, but it rapidly passed off and after ten minutes the saliva was collected during mastication and observed. When the anterior two-thirds of the tongue are cocainized, there was an obvious diminution of both total amount and alkalinity.

Cocainizing the posterior third of the tongue produces even a greater diminution in both amount and alkalinity of the total saliva during biscuit mastication, the depression being chiefly in the amounts per minute from each gland. During apple mastication the decrease from the normal is very considerable from all the glands in both amount and alkalinity, the total alkalinity per minute being reduced by 70%.

The results of partially cocainizing the whole tongue are very much the same as in the latter case, the decrease in amounts per minute being more affected than the alkalinity per cubic centimetre, but the alkalinity index is even more reduced than by cocainizing the posterior third alone.

That similar states may be present abnormally in the mouth seems to be extremly probable. I have estimated accurately by titration the perception of such tastes as sweet, bitter and acid in about a dozen individuals and although this number is insufficient from which to form definite conclusions, it is sufficient to show that the sensitiveness of the nerve endings of the tongue does vary perceptibly in different individuals and, moreover, that a dulled taste-sensibility and marked susceptibility to septic teeth seem to be associated.

Salivary depression may be induced psychically. Pavlov has observed that strong excitement in a dog may be sufficient to suppress entirely the flow of

saliva. The same thing is well known to occur in the human subject. The effect of strong mental concentration is always to produce a condition of "dry mouth"; the urinary secretion is stimulated, but the salivary secretion is depressed.

On the other hand strong muscular exertion produces at first a much increased flow of saliva, followed some time afterwards by a diminution and a sense of dryness, due, most probably, to loss of water from the body *viâ* the sweat glands.

Here, then, we find two concomitant conditions of higher civilization, increased mental excitement and subnormal muscular exercise, both tending in the direction of decreased salivary secretion.

It has frequently been noted that climatic changes, a rapid change for instance from the temperate climate to the tropics, is followed by a rapid increase in oral sepsis. This may be due to a certain extent to a change of diet, but it is more likely to be due, I think, to the disturbance of the established balance between the kidneys, sweat and salivary glands, acting in nearly all cases in an excitation of the two former and a depression of the latter. This is the more probable, since Englishmen at least, as is well known, insist as far as possible upon an "English" dietary wherever they may be, instead of adapting themselves to that dietary which the process of evolution has demonstrated to be the most fitted for the particular locality.

The Presence of a Coating "Fur" Upon the Tongue.

Fur is really salivary deposit. It is composed of mucin, epithelial cells and masses of organisms and is identical with the deposit found around the necks of teeth. The condition is promoted by a scanty, viscous saliva following previous irritation of the mouth by excess of such things as alcohol, tobacco, sugar or by the over-indulgence in salivary depressants, such as tea containing too much tannic acid, bread and butter and alkalis. But, more important still, it may also be produced, I believe, through the action of the sympathetic nervous system in the following manner:

We have seen that diminished stimulation of the glosso-pharyngeal chorda-vagus reflexes is followed by a diminution in salivary, gastric and pancreatic secretions; this means increased stasis which induces increased proliferation of organisms, with the almost certain production of toxins and their absorption. Now, I think there is considerable reason clinically for holding that these toxins or at least the endotoxins produced have a definite effect upon the sympathetic or autonomic nerves.

I have tested the effect on rabbits of the injection of endotoxins prepared from human mouth organisms and I find that they produce a definite, though not great rise in blood pressure, probably through vaso-constriction, since the rapidity and intensity of the heart beat was not increased. This points to sympathetic stimulation. If this be so, then we have the whole train of symptoms associated with severe oral sepsis and alimentary toxæmia explained, the cold extremities, the pale grey complexion, the headache, the constipation (due to intestinal dilatation), the anorexia (due to gastric stasis and fermentation) and the furred tongue, the latter being produced secondarily by the effect of sympathetic stimulation on the salivary glands which as is well known, is to cause the flow of a very scanty and viscous saliva of high specific gravity that gets stranded in the papillæ of the tongue and gives the appearance of a dense deposit.

I have also found that by giving rabbits daily, by the mouth, one cubic centimetre of a broth culture from carious teeth, all the symptoms of oral sepsis and intestinal stasis were produced (as far as one could judge in an animal); at least the symptoms of malaise, anorexia and diminished defæcation were most marked.

Thus there is set up an extremely strong vicious circle. Diminished oral stimulation produces oral stasis and sepsis initially, this in turn producing gastric and intestinal sepsis, thus giving rise to toxins, which being absorbed still further increase oral sepsis and diminish taste-perception by causing intestinal dilatation, which increases toxic absorption. And so the cycle goes on getting stronger and stronger until the patient's alimentary system can no longer resist the strain or perform its function; all of which things points eloquently in one direction: the desirability, nay, the necessity of maintaining the glosso-pharyngeal-chorda-tympani-vagi reflexes in an active and sensitive condition, if the health of the alimentary tract is to be maintained.

DR. S. A. MOORE (Dunedin) asked what was the condition of the teeth in New Guinea. He also wished to know whether it was a fact that vomiting was common in hypotonicity.

DR. W. B. MERCER (Wellington) asked whether there were any specific stimulants to the glosso-pharyngeal nerve. Could a cocktail be included in this category?

DR. HARVEY SUTTON (Sydney) said that the great problem in social life was the industrialization of the population, the result of the growth of urban communities whose diet was almost entirely imported and sophisticated. Fresh food, fruit, vegetables and especially milk were consumed in small amount, milk being consumed to the extent only of 0·28 litre (half a pint) a head per day. Sapid food did not seem of such importance in the diet of children and excessive acids as in citrus districts appeared most destructive to teeth. The aborigines, who had excellent food, had a non-sapid diet, but their children who lived on the white man's diet in government settlements had rotten teeth.

He believed that the most important phase of prevention was the creation of resistant enamel which was the most important need and was decided in the first two years of life by an adequate vitamin diet.

Dyspepsia as McCarrison had demonstrated, was the regular prodromal association of deficiency in vitamin and the sympathetic stimulation of sunlight. Fresh air and exercise were necessary. He considered that milk was the best protective food yet devised to meet modern difficulties in diet.

DR. MARY DE GARIS (Geelong) held that caries was due to faulty diet and to local infection. She maintained that the proper treatment was the removal of the tooth. Filling merely concealed the sepsis. A filled tooth was a foreign body and should not be tolerated.

DR. BUCK spoke in reply about the introduction of the *kumara* into New Zealand.

DR. PICKERILL stated that he had found that a moderate dose of alcohol had a beneficial effect on salivary and gastric secretion. In answer to Dr. Harvey Sutton he stated that the error in the case of the children quoted lay in their consumption of vast quantities of oranges and

peaches; small quantities produced physiological stimulation, large quantities exhaustion of salivary secretion. He agreed that the building up of the teeth was the most important factor. He had been struck in his researches by the resistance of Maori teeth. In the Dunedin Dental Hospital no student was allowed to fill a root canal until two bacteriological tests had been carried out and no bacteria had been grown.

DR. RITCHIE gave two reasons why milk was not used in Samoa. Firstly the average temperature was 29° C. (84° F.), there being few degrees' variation between summer and winter; secondly though Samoans had solved some problems, they were still primitive in other respects. They would not go to the trouble of keeping down the bacteriological content of milk, hence to advocate milk for consumption in Samoa was to court danger.

SECTION II.—SURGERY.

THE STATUS OF GASTRO-ENTEROSTOMY IN GASTRIC SURGERY.

By H. B. DEVINE, M.S.,

Honorary Surgeon to In-Patients, Saint Vincent's Hospital, Melbourne; Assistant Stewart Lecturer in Surgery, University of Melbourne.

GASTRO-ENTEROSTOMY which is not an ideal, but is at present a much discussed operation, has had many vicissitudes in its "life history." It is a simple operation, yet it requires more surgical "nous" than almost any other operation.

At first, with its background of early gastric surgery, its successes, perhaps out of perspective, were epoch making and it became a vogue; then, like every other great success which generally contains the germs of its own failure, it came to be used without regard to definite principles, as a panacea for every gastric ill. Very soon indubitable failures began to be reported and these implanted in surgeons' minds a suspicion that the value of this operation was exaggerated and that it was not even a permanent cure for those gastric and duodenal lesions such as ulcer for which it was designed and for which, if of any use at all, it was eminently suited. We next find Continental surgeons putting forward very radical procedures such as partial gastrectomy for gastric ulcer and even for duodenal ulcer, as based on better scientific principles and giving more consistent results than gastro-enterostomy. While, perhaps, this radical school of gastric surgeons goes too far and takes an unwarranted and unnecessary risk, it is influenced by the now somewhat discredited doctrine, that in 50% of cases cancer arose on an old ulcer. Nevertheless, this school has done good in demonstrating the efficiency and safety of partial gastrectomy and the unjustifiability of gastro-enterostomy in certain kinds of old and penetrating gastric ulcer, especially if situated in the proximal two-thirds of the stomach; but its advocacy of partial gastrectomy instead of gastro-enterostomy for duodenal ulcer is open to doubt.

It is interesting in relation to the status of gastro-enterostomy in modern gastric surgery that at the recent meeting of the British Medical Association at Nottingham, as exemplifying how tenaciously English surgeons have clung to gastro-enterostomy, we find Herbert J. Patterson, in summarizing his paper, remarking: "I cannot do better than quote a sentence from a paper by Moynihan which admirably expresses my own views. I am an ardent and sanguine advocate of gastro-enterostomy than which I think there is no operation in all surgery more completely satisfactory." Indeed, it would be difficult to expect any operation to give better results (practically 90% cured) than his own and those of his illustrious English colleagues, Moynihan, Sherren and Walton, whose figures he quotes.

On the other hand, at the very same meeting we have Professor Finsterer, representing Continental surgeons such as Riedel Payr, Clairmont, Haberer, prefacing his paper by the following statement:

> "In my opinion the results of routine gastro-enterostomy for gastric and duodenal ulcer are not satisfactory because:
>
> (*a*) the operation does not generally lead to the healing of the ulcer;
> (*b*) gastro-duodenal ulcers are not a very unusual complication of the operation;
> (*c*) hæmorrhage from an unhealed ulcer is fairly frequent and a perforation of gastro-enterostomy is not unknown."

Patterson gives for gastro-enterostomy and of these a large proportion were anterior gastro-enterostomies, 82% of cures. He excludes the patients he could not trace and treats them as failures. If he left these out it would mean 90% of cures. Of the lesions 172 were gastric ulcer, 323 were duodenal and four were gastric and duodenal; 495 of the patients recovered, four died. There were bad results in thirty-seven and forty-eight were untraced. He thinks if patients take care of themselves after the operation, 90% of cures would result.

My criticism of this very sanguine view of gastro-enterostomy results, based on my own experience, is that what the surgeon often regards as a perfect cure of ulcer and a great success, the patient, notwithstanding the cure of the ulcer, often regards as a miserable failure, because, since the operation he has become afflicted with a train of very unpleasant, nauseating, but obscure symptoms almost worse than those of original ulcer. These symptoms, regarded by the surgeon as neurasthenic or negligible, are very real, for when the "successful" gastro-enterostomy is undone, the patient is delighted with the relief obtained.

The Mayo Clinic which may be taken as representative of conservative American surgery, still relies a great deal on gastro-enterostomy in the treatment of duodenal ulcer, but more and more it is becoming relegated to its true sphere in gastric surgery, that is, a secondary operation. It is now most often combined with resection of the duodenal ulcer (50%, Judd), while gastrectomy is reserved for the very chronic or penetrating duodenal ulcer. The average American results given are 80% of cures; but it was my experience on my recent visit that most American surgeons, like European surgeons, were inclined to mistrust and at times discard gastro-enterostomy in the treatment of even duodenal ulcer, because it was uncertain in its

physiological effects and inconsistent in its cure of even the ulcer for which it was suitable. Moreover, it not infrequently generated jejunal ulcer.

It is only fair to point out that the advocates of gastro-enterostomy contend that it is not done in properly selected cases nor with the requisite knowledge of physiology and pathology nor with the operative judgement, experience, skill and precision that almost more than any other operation it demands.

Physiological and pathological investigations of many patients whose unsuccessful gastro-enterostomy I have undone, compared with a similar investigation of the reconstituted stomach or of the organ, after a partial gastrectomy or exclusion which followed, have taught me much in relation to what essentials make for consistent results and success in gastro-enterostomy. The following conception of the physiology of gastro-enterostomy is, therefore, partly based on this experience and partly on an appeal to modern physiological gastric principles.

Physiology of Gastro-Enterostomy.

The curative action of gastro-enterostomy in my experience depends almost entirely on its effect on the "mechanism of retention" of the stomach, that is, on its effect on the emptying time. It also, but to a lesser extent, depends on an increase of alkaline regurgitation, but this latter to a large extent goes *pari passu* with the emptying time, so that the fundamental physiological aim in gastro-enterostomy is to obtain an ideal emptying time. Indeed, it is probably a disorder, at the instance of the autonomic nervous system, of that very primitive and basic function of the alimentary canal, the "mechanism of retention," that is probably the fundamental basis of the ulcer we seek to treat by gastro-enterostomy.

Emptying Time.

The emptying time will depend on what Alvarez calls the "gradient" of the stomach and intestine and I think possibly also on the distance of the stoma from the pylorus.

A knowledge of the functions of the primitive alimentary canal will help us to understand the physiology of the emptying time. These are:

(i) Intake and propulsion of food aborally.—Alvarez and his collaborators have brought out the fact that there is a "gradient" from the stomach and including that organ downwards. Strength, tone, irritability, rhythm, all diminish as the terminal ileum is approached. The steeper this "gradient," the better is the propulsion and the better is the emptying time in a gastro-enterostomy.

(ii) Rejection of food in response to a gross or noxious stimulus by reverse peristalsis and this for obvious conservative reasons.

(iii) Retention of food.—On the simple alimentary canal is grafted some mechanism to retain food for digestion and absorption. As towards the end of each retention sac reservoir there is a reverse peristalsis present, for example, in the stomach in pyloric obstruction, and normally in the duodenum, terminal ileum, ascending colon, it is probable that this "retention mechanism" is built on the plan of the reverse peristaltic wave, that is contraction below—the sphincter—with a complementary relaxation above. This—the "retention posture" of Sherrington and of Hunter—must, of course because of this very early development, be subserved by the original "nerve net" to which the sympathetic corresponds.

It is probably a disorder of the physiology of this sensitive "retention mechanism," whether congenital or acquired, on which the regulation of acidity depends that we need to aim at correcting with our gastro-enterostomy.

The emptying time in gastro-enterostomy also depends on the situation of the stoma in relation to the pylorus.

I have been able to show[1] that this is a clinical fact and that under similar circumstances on the same patient the further away from the pylorus and the prepyloric retentive mechanism—the deep peristaltic area—I placed the stoma in a gastric exclusion, the quicker was the emptying time. A stoma placed well towards the cardia emptied more like the œsophagus. So that, always excepting errors in technique, the emptying time in gastro-enterostomy depends on the "gradient" and the situation of the stoma.

As a practical application of these principles my main endeavour in gastro-enterostomy has been to obtain an efficient emptying time, for I know that this will insure a maximum alkaline regurgitation and low acidity, while short contact of food with the stomach will also mean less secretory stimulation. Having this in mind, I make as a routine two observations after a gastro-enterostomy. Firstly I have a skiagram taken to make sure of the exact emptying time and that there is no residual rest to act as a persistent secretory stimulant. Secondly I have a fractional test meal carried out to find the acidity as a guide for postoperative treatment.

In the steep "gradient" of the hypertrophied gastric muscle of innocent pyloric obstruction there can be no doubt that gastro-enterostomy is indicated and, if properly done, it never has any by-effects. As gastric carcinoma infiltrates the gastric muscles and lowers the "gradient," gastro-enterostomy can have no practical application except in a local pyloric growth. But it is in the treatment of duodenal or gastric ulcer that our gastro-enterostomy problems really arise.

In order that the physiology of gastro-enterostomy may be intelligibly applied, a clear idea of the causation of these ulcers is essential. Unfortunately, this is not possible with our present knowledge, but the following convictions based on my own clinical experiences have been for me a good working hypothesis.

Firstly, that there are two kinds of duodenal ulcer:

(*a*) The very chronic, what we might call "acid produced" ulcer, which occurs in sthenic persons

with good resistance and which is, perhaps, exclusively due to a very high acid, the result of disordered gastric physiology. It is preceded by an "acid gastritis" (Aschoff), perhaps with erosions and it is the same sort of ulcer as Mann produces in his laboratory dogs when he diverts the duodenal secretion into the ileum.

(*b*) A less chronic and what we might call "debility" ulcer in which a lowering of resistance plays the principal part. In this ulcer either some general constitutional weakness or some local loss of resistance, such as local infection or anæmia, is the main pathogenic factor. A moderate or even low acidity is only an exciting factor. This ulcer is comparable to the experimental ulcer that Rosenow produces by infection.

Secondly, that in the application of gastro-enterostomy for the cure of ulcer there are two fundamental considerations to be taken into account:

(i) The abnormal physiological and pathological conditions which produced the ulcer. These may be but are not necessarily still present as, for example, a neurogenic disorder of the "mechanism of retention" and high acidity, infective focus, local or general vascular changes or general disease.

(ii) The gross, degenerate tissue changes brought about by prolonged secondary infection in the chronic calloused ulcer. These are fibrosis and local devascularization, permanent destruction of specialized tissue.

In (i) gastro-enterostomy can remedy the abnormal physiology. The associated disease must be removed or treated. In (ii) the changes in the very old ulcer would preclude its healing, even in the absence of acid and under the most favourable physiological conditions that an ideal gastro-enterostomy could give.

In the "debility" ulcer it is more a matter of medical treatment, improvement of general health, of focal sepsis, diet, drugs, of overwork and it is on this class of ulcer that gastro-enterostomy is often erroneously done, though in the more chronic cases of the group, gastro-enterostomy is justifiable and usually provides a permanent cure.

Unsuccessful Gastro-Enterostomy.

Numerous frankly unsuccessful results of gastro-enterostomy have been reported. Undoubtedly these have done much to shake the confidence of surgeons in this operation. Many of these should never have occurred and arose out of ignorance of proper technique or because the operation was done in the presence of associated disease or because of obvious stupidities unnecessary to detail here. But it is not of these that I would speak, but of those bad results which happen to competent surgeons.

Unsuccessful results of gastro-enterostomy in patients operated on in our own clinic, fell naturally into two groups, (i) ulcer formation, (ii) gastric motility errors.

Ulcer Formation.

Ulcer formation occurred in the following ways. The patient's original symptoms persisted because the ulcer had not healed (1% to 2%); the original ulcer and original symptoms recurred (4%); after a period of well-being the somewhat similar but more severe symptoms of jejunal ulcer appeared (5%); in 5% of cases, considering himself cured, even many years later the patient was suddenly stricken down by a sudden, severe, painless, hæmatemesis, the result of an acute ulcer developing on the old scar.

T., *ætatis* forty-five years, had a gastro-enterostomy performed for an old chronic duodenal ulcer. He was perfectly well for four years; then a large hæmatemesis occurred without any preceding symptoms of ulcer and the patient died.

In all these patients there was a high acidity notwithstanding the gastro-enterostomy and in the light of the accepted part acid plays in the ætiology of ulcer, it must be regarded as the causal factor of this group.

Gastric Motility Errors.

The patient was completely relieved of the symptoms of ulcer, but as a direct effect of the gastro-enterostomy, he suffered from most distressing symptoms after meals, such as nausea, sinking sensation, vomiting and sometimes from diarrhœa with copious "explosive" motion and great loss of weight and energy.

A "precipitate emptying time" was in many instances the cause of these symptoms which were much worse if duodenal ileus were present.

Other errors of motility were attributable to excessive spur formation at the anastomosis, to twisting in its long axis of a too long or too short afferent loop. Here either a "vicious circle" occurred at the time of the operation or the patient had a stormy convalescence. Some of these patients had symptoms referable to a distended afferent loop. These symptoms were nausea, vomiting, with pain around the umbilicus and in the right hypochondrium and slight jaundice, while other symptoms, such as epigastric discomfort or pain, much vomiting, were attributable to a distended stomach or a permanent gastric residue.

It is most difficult to assign causes for all these failures, but I have no doubt that a motility error is really the basis of all unsuccessful results of gastro-enterostomy, even in the group ulcer formation.

Severe pain is such a feature in this group (i), which we might call the jejunal ulcer group, that surgeons advance this type of failure as the principal objection to gastro-enterostomy. But it is my experience that the seriousness and frequency of the kind of failure in group (ii) is not at all generally recognized, especially in the less obvious cases and that as an objection to gastro-enterostomy it ranks much higher than group (i).

Symptoms originating from gastric motility errors are occasionally vague, indefinite and indefinable and are often, especially in the less frank type, attributed by the surgeon to neurasthenia or hypochondriasis; the unfortunate patient, unable to persuade anyone that he is really ill, settles down to a state of resigned, chronic invalidism.

May I give you some instances?

I can recall a valedictory letter of a well-known medical man on whom I undid a gastro-enterostomy:

I can now eat anything without any feeling of distension or of pain and, above all, I have lost all that terrible feeling of nausea and depression which had been my constant companion for nine weary years. Words cannot express my gratitude for the change and it is the greatest relief for me to know how very real all my dreadful symptoms were.

In his case a test meal had completely left the stomach in ten minutes. No food was ever vomited, yet at intervals the stomach would fill by regurgitation from the afferent loop; this was always vomited.

Another patient had a similar remarkably rapid emptying time (six minutes), then very quickly the stomach could be seen by X ray examination to fill with secretion from the afferent loop. This caused distress and vomiting with relief. The reason why this secretion, entering from the pyloric end, would not empty in the same way as the food which entered from the œsophageal end, is most interesting. Distension below closed the stoma; distension above opened it. Is it again the law of the intestine? In both these cases the stoma was very big and far into the fundus, the propulsive end of the stomach.

A patient of Dr. Stawell, a woman, regarded as hypochondriacal and neurasthenic, after a "successful" gastro-enterostomy. travelled the world for years in search of relief for nausea after meals, sinking sensations, lassitude, emaciation, copious fermenting motions and other indefinable symptoms. She was reduced to a life of chronic invalidism, was almost bedridden and in search for a cause for her troubles had been subjected to many non-gastric operations without getting relief. In consultation with Dr. Stawell it was decided to undo her gastro-enterostomy and with many misgivings this was done. She soon developed into a big, strong, healthy, athletic woman. She had duodenal ileus, a very small afferent loop and an enormous efferent loop, a big stoma far over towards the fundus.

Dr. Sewell may also remember a somewhat similar case. Here are two more examples.

Two strong young men, after ill-considered gastro-enterostomy, became apparently two useless, "hospitalized" neurasthenics; they found it impossible to convince any physician or surgeon that they had anything organically wrong with them. I myself found it difficult to define any symptoms attributable to the gastro-enterostomy, yet when I undid the gastro-enterostomy in each, they at once increased rapidly in weight, lost their "epigastric sensations" and became normal and not only resumed but enjoyed their work.

It is this class of case and this kind of after effect, even in its lesser degrees, of which I am so dreadfully afraid after gastro-enterostomy.

Jejunal Ulcer.

Jejunal ulcer in group (i) from a prophylactic point of view calls for some special consideration. It would seem from careful statistical study that 5% would represent the highest number of secondary ulcers that form after a gastro-enterostomy. Much doubt exists as to its causation, but from my own experience I would regard it as an established fact that high acidity is the essential cause of jejunal ulcer and that it is comparable to the "acid-produced" duodenal ulcer in the sthenic person and the experimentally "acid-produced" ulcer of Mann; further, I would regard other causes which have been advanced, such as hæmatoma in the suture line, imperfect coaptation of the mucous membranes, unabsorbable sutures, tissue injuries following the use of clamps, as only contributory and minor causes.

Every case of jejunal ulcer with which I have dealt, has been associated with high acidity and I have frequently been able to show that this preceded, not followed, the ulcer.

Jejunal ulcer is prone to form after a gastro-enterostomy on patients where either from loss of ordinary normal regurgitation or from an increased secretion the patient has a very high acid to start with. The gastro-enterostomy, even if perfect, cannot sufficiently reduce the high acid. In one of my early patients with duodenal ulcer the acidity was exceptionally high (90). I was not surprised when this man developed a jejunal ulcer after gastro-enterostomy, but I did not expect the recurrence which developed after partial gastrectomy for the first jejunal ulcer. In patients with such a high acid it is unwise to perform a gastro-enterostomy and it is always better to do a fairly extensive gastric exclusion (Devine) or a partial gastrectomy.

My own investigations would lead me to believe that an error not only of gastric but also of intestinal motility is the basis of the "high acidity failures." Thus pyloric occlusion excludes food from the "afferent loop." This greatly minimizes intestinal motility and peristalsis and therefore alkaline regurgitation through the anastomosis with the consequence that a high acidity developes and predisposes to jejunal ulcer (33% in some statistics).

Probably a similar diminution of alkaline regurgitation explains why I found jejunal ulcer occurring next in frequency in gastro-enterostomy combined with enterostomy where intestinal motility and its regurgitation effect were excluded.

Though in my series jejunal ulcer was found in a group of patients when the gastro-enterostomy was associated with high acid, jejunal ulcer did not develope in in every member of the group. But from this insufficient reduction of acidity which was attributable to minor delays in gastric motility following a badly executed and unphysiologically designed operation, even if a jejunal ulcer did not develope, the patient had a most unpleasant dyspepsia and therefore an unsuccessful gastro-enterostomy.

Technical Errors Causing Gastric Motility Failures.

The emptying time is retarded. The afferent loop is too long and a bad twist in applying the intestine to the stomach is not noticed; the loop is too short and a slight twist has no latitude to untwist; the afferent or efferent loop is kinked near the anastomosis; the stoma is placed in the retentive deep peristaltic area too near the pylorus; in the very dilated stomach of pyloric stenosis the stoma is drawn up towards cardia and lesser curve by the postoperative contraction and retraction of the dilated gastric muscle; the stoma is puckered by being stitched into the rent in the transverse mesocolon on the intestinal side of the anastomosis;

the gastric and intestinal muscle of the patient has not a normal "gradient" (Alvarez); the stoma is too small or the direction is wrong or it is too near the lesser curvature. Such are some of the errors which impair gastric evacuation or leave a slight permanent residue to act as a continual secretory stimulant.

The emptying time is too rapid—"precipitate"; the stoma is too large and is placed too far towards the cardia—too far into the propulsive part of the stomach.

A spur, comparable to the spur of a colostomy, forms at the anastomosis and, just as the colostomy spur is designed to project the fæces to the surface, so this spur projects all duodenal contents into the stomach. But it offers to gastric evacuation two similarly placed exits, so that afferent and efferent loops alike must receive the gastric contents; in addition, this spur acts as a mild chronic obstruction to the intestine and prevents adequate emptying of the afferent loop.

There is, of course, the maximum alkaline regurgitation in these patients and the gastric contents are quite alkaline and full of bile and the ulcer is always cured.

A variety of causes may be responsible for spur formation, but generally it is attributable to a very large stoma placed too high on the posterior wall or too far towards the fundus. The edges of a large wound in the intestine evert from muscle action. This and the high situation of the stoma which causes the intestinal loops to lie parallel, produce the spur. Minor varieties of spur are caused by the loop of intestine being fixed neither in an iso-peristaltic nor in an aniso-peristaltic, but in an intermediate position or where a stoma is drawn up by contraction of a dilated stomach or by a high stomach or when the stoma has been fixed above the transverse mesocolon.

Resection of a gastric ulcer will also draw up the stomach and thus the stoma, so that in those stomachs in which I have resected an ulcer of the lesser curvature and even sometimes in some of of the small high stomachs, I resected the vessels of the greater curvature and placed the stoma on the greater curvature to avoid any tendency to gross spur formation.

I have been able to produce, experimentally, this spur effect in a dog.

While gross spur formation is a catastrophe, a mild spur, if it can be skilfully contrived, enhances the value of a gastro-enterostomy, as it insures alkaline regurgitation and adequate reduction of acid.

Without spur formation a milder form of excessive regurgitation which is perhaps not so distressing, may occur in hypotonic stomachs. It is in relation to this kind of gastro-enterostomy failure that the "gradient" hypothesis of Alvarez is illuminating.

A healthy person with good function of the alimentary canal has a normal steep "gradient." The patient with a hypotonic stomach has an abnormal, flat "gradient," that is insufficient elevation of the tone and peristaltic action of the stomach above that of the intestine and therefore, even though a pathological lesion be present, a fundamental essential in the physiology of gastro-enterostomy is absent. This is the class of patient in whom gastro-enterostomy is occasionally done for gastric symptoms in the absence of a demonstrable organic gastric lesion; as the symptoms are almost certainly due to a neuromuscular disorder, it is and must be a failure. While the gastro-enterostomy would not do much harm in a normal stomach, it must necessarily be a catastrophe in the functionally afflicted stomach.

"Precipitate" evacuation is such a serious motility error and causes such serious symptoms that generally it necessitates undoing the gastro-enterostomy.

Immediately after meals the patient suffers from great nausea, depression, sinking sensation and other unpleasant symptoms. These symptoms are improved by the recumbent posture. Sometimes the stomach may empty within five minutes. At operation the efferent loop of intestine is found hypertrophied and nearly as large as the stomach, while the afferent loop is small and contracted. When this very rapid emptying occurs in association with a gross duodenal ileus for which the gastro-enterostomy had been erroneously done, scarcely any intestinal digestion takes place. So rapid is the gastric evacuation that, held up by the dilated duodenum, the pancreatic secretion is not able to mix with the food with the result that in from twelve to twenty-four hours, large, copious, undigested motions are passed and the patient, suffering from emaciation, is forced to spend a considerable part of his or her time in bed to minimize the rapid evacuation.

From what I have said it is obvious that for an ideal gastro-enterostomy the surgeon must understand the physiology of gastro-enterostomy. He should know the particular patient's physiology and pathology. This can be mastered before the operation only by careful study of the history of the patient, the result of X ray examination and the result of a test meal. In addition to this, the surgeon must appreciate the causation of various grades of ulcer that he may apply this physiological knowledge in the right way and he must also remember that gastro-enterostomy relies only on an alteration in gastric physiology and that it has no direct effect on the ulcer; its proper function in gastric surgery is as a secondary operation to "direct action" on the ulcer, except in about 40% of cases.[1]

References.

(1) H. B. Devine: "Basic Principles and Supreme Difficulties in Gastric Surgery," *Surgery, Gynecology and Obstetrics*, January, 1925, page 1.

(2) F. C. Mann and C. S. Williamson: "The Experimental Production of Peptic Ulcer," *The Annals of Surgery*, 1923, Volume LXXVII, page 409.

[1] At the end of the paper Mr. Devine demonstrated with the aid of cinematograph films the essential technique of gastro-enterostomy.

ACUTE PERFORATION OF GASTRIC AND DUODENAL ULCERS.

By ST. JOHN W. DANSEY, M.B., Ch.M. (Sydney),
Honorary Surgeon, Royal Prince Alfred Hospital, Sydney; Lecturer in Clinical Surgery, University of Sydney.

PROBABLY there is no condition in surgery in which successful treatment depends more on early diagnosis and prompt operation than acute perforation of gastric and duodenal ulcers. Therefore, I trust, a short time spent in the consideration of this subject will be of some value to most of us, especially those not attached to metropolitan hospitals, the only places where many of these abdominal catastrophes are seen.

In textbooks we still find it stated that perforations of gastric and duodenal ulcers are more common in women than in men. Walton and Moynihan question this statement and their own statistics show that the predominance of perforations is in the male. In the figures taken from the records of the Royal Prince Alfred Hospital for the last ten years we note that perforation of gastric ulcers occurred in thirty-nine males and twelve females and of duodenal ulcers in sixty-one males and seven females. This is a striking contrast of the incidence of perforation in the two sexes.

How can this be explained? Not by the more vigorous life of the male, though it is true that the age of most of the patients lies between twenty-five and forty-five years, for perforation occurs as frequently during the night's rest as it does during active work.

Is it that the male is more prone to the chronic indolent ulcer which has been proved to be the type more likely to rupture? Perforation of an acute ulcer of the stomach or duodenum hardly ever occurs. At operation perforated ulcers are seen to have an œdematous margin, suggesting an acute condition, but this is the result of inflammatory reaction and pathological examination reveals fibrosis about the ulcer, the chronic type at base.

But are men more prone to chronic gastric ulcers than women in the proportion of over three to one? I think not. How then can this incidence be explained? The position of the ulcer in nearly all perforations calling for immediate operations is partially or wholly on the anterior aspect of the stomach and duodenum. In our cases recorded only four of the fifty-one perforations did not occur on the anterior surface of the stomach and of duodenal perforations only eight of the ninety-eight.

Ulcers on the posterior surface of the stomach and duodenum, tending towards perforation, become adherent to the adjacent organs, so that a sudden perforation with the outpouring of the stomach contents into the peritoneal cavity does not occur.

The investigation of all gastric ulcers operated on at Royal Prince Alfred Hospital during the last ten years shows that the anterior situation is far more common in the male in the proportion of about four to one. May not the fact that the more frequent anterior position of the chronic gastric ulcer in man be the reason why acute perforation of the ulcer is more common in the male than the female? Duodenal ulcers which are relatively more prone to perforation than gastric ulcers, are known to occur more often in the male.

The age when perforation of gastric and duodenal ulcer is most liable is between twenty-five and forty-five years. One patient was eighteen years of age; two others were eighty years. The average age for perforation of gastric ulcer, 41 years, is much the same for duodenal ulcer, 40·9 years.

Acute perforation of malignant ulceration appears to be rare, for in this record of one hundred and forty-nine cases of ruptured gastric and duodenal ulcers, only one was reported to be carcinomatous.

ACUTE PERFORATIONS OF GASTRIC ULCERS.

Period.	Number of Patients.	Sex.		Deaths.	Mortality Rate.	Mortality Rate Operated Within 8 Hours of Perforation.	Mortality Rate Operated Within 16 Hours of Perforation.	Mortality Rate Operated 16 Hours and Over After Perforation.	Average Time after Perforation Before Operation, in Hours.
		Male.	Female.						
1915 to 1919 ..	18	15	3	8	44·4%	14·2%	66·6%	62·5%	28·7
1920 to 1925 ..	33	24	9	5	15·1%	11·1%	18·1%	25%	9·4

ACUTE PERFORATIONS OF DUODENAL ULCERS.

Period.	Number of Patients.	Sex.		Deaths.	Mortality Rate.	Mortality Rate Operated Within 8 Hours of Perforation.	Mortality Rate Operated Within 16 Hours of Perforation.	Mortality Rate Operated 16 Hours and Over After Perforation.	Average Time after Perforation Before Operation, in Hours.
		Male.	Female.						
1915 to 1919 ..	34	31	3	5	14·7%	—	21·4%	28·5%	19
1920 to 1925 ..	64	60	4	8	12·5%	5·5%	13%	60%	6·4

Chronic ulcers of the stomach and duodenum gradually become larger and deeper by the eroding action going on at their bases. When this approaches the peritoneum, it sets up a certain amount of plastic peritonitis which, when the ulcer is on the posterior surface, become adherent to the surrounding tissues. If the ulcer is on the anterior or free surface of the organ, the erosion progresses until only the peritoneum is between the peritoneal cavity and the gastric contents. At times a patient presents all symptoms and signs of a perforated ulcer when operation reveals only a congested area of peritoneum with a few flakes of lymph over the site of ulcer. This is what might be called the preperforative stage and lucky is the patient when this has produced pain severe enough to demand surgical attention.

I have on two occasions opened an abdomen for a leaking ulcer to find the stomach in its ulcerative area adherent to the anterior abdominal wall. Unfortunately this rarely occurs.

There is then a stage when the ulcer has eroded down to the peritoneum and it requires only a slight rise of an internal pressure to bring about a rupture. This may be caused by the intake of food, as is seen by the number of cases occurring after a meal. Even the outpouring of the gastric juices excited by the anticipation of a meal appears to be sufficient to cause the rupture, as in a case reported by W. Martin: a patient was seized with agonizing abdominal pain just as she was sitting down to a Christmas dinner. Might not the hunger contractions of the stomach wall in this case be the exciting cause? Carlson has shown that the empty stomach undergoes rhythmic contractions at a very uniform rate of about three per minute and that at regular periods this is interrupted by a series of powerful contractions, each of which lasts approximately thirty seconds. These periods of powerful contraction are recognized by the subject owing to the simultaneous appearance of the sensation known as hunger. He considers that there is no essential difference between the hunger contractions and the peristaltic waves that accompany normal gastric digestion.

Physical exertion, especially when the stomach is full, is often the exciting cause of the rupture. I attended a bricklayer who, after a heavy lunch was with a loaded hod ascending a ladder, when violent abdominal pain seized him, so that he fell to the ground and was admitted to hospital for abdominal injuries due to the fall. It was only after a careful history had been taken and the rigid upper part of the abdomen had been noted that the true sequence of events was obtained.

Perforation frequently occurs when the patient is asleep; perhaps the rhythmic muscular contraction of the stomach produces sufficient pressure to cause the rupture, especially at the prepyloric and pyloric portion where by far the larger number of perforations is found.

Practically 90% of perforated ulcers occur in the immediate area of the pylorus, either on the gastric or duodenal side of the sphincter.

In the series here considered all with the exception of one patient gave a history of previous attacks of indigestion usually existing on and off for months or years. This is what would be expected as it is the chronic ulcer that ruptures. In many some premonitory symptoms occur in the form of acute abdominal pain and collapse which soon subsides, to be followed in a day or two by the true rupture. This is due to the localized peritonitis occurring over the ulcer as the erosion attacks the peritoneum.

In all the one hundred and forty-nine cases of ruptured gastric and duodenal ulcers the first symptom was severe, agonizing pains in the upper part of the abdomen, frequently described like the stab of a knife. The least movement seems to add to its severity, so that the patient holds himself rigid and resists all attempts of his friends to move him. The pain is constant and gives no signs of the relaxation of colic. The upper abdominal muscles are found to be board-like, hard, resisting, motionless; in no other condition does this so constantly occur. It forms one of the best aids to correct diagnosis. Vomiting in the earlier stage before peritonitis has advanced is not common. The breathing is shallow and short to avoid any movement of the acutely irritated peritoneal surfaces below the diaphragm. The facial expression is drawn and anxious and any attempt at abdominal examination is piteously resented. The skin may be bathed in cold sweat suggesting shock, but the pulse is about sixty per minute and the blood pressure is not lowered. Later, when the escaped gastric or duodenal juices have set up a spreading peritonitis, the pulse rises and with it the abdominal distension and general signs of peritonitis. The gastric contents in these ulcerative conditions of the stomach and duodenum are highly acid and sterile, so that the peritonitis at first is purely an irritative one, but later the inflammation of the peritoneum permits the escape of the bacteria from the intestines and brings about an infective peritonitis.

In the Pathological Department at Royal Prince Alfred Hospital investigation has been made concerning the presence of bacteria in gastric contents. The result shows that, while in gastric contents of lowered acidity or in the absence of hydrochloric acid numerous organisms may be present, yet with normal acidity the contents are sterile a short time after ingestion. So we may presume that in cases of gastric and duodenal ulcers when the hydrochloric acid is raised, the contents are sterile.

In many cases of ruptured duodenal ulcers the abdomen is opened over the appendiceal region, because the escaping irritative fluid flows down into the right kidney pouch and on the lateral side of the caecum to reach the pelvis. The free bile-stained fluid with particles of food reveals the true pathological condition present. The loss of liver

dulness in the early stage owing to presence of gas is of help, but it is only of value if positive. Better results are obtained from the treatment of ruptured duodenal ulcers than ruptured gastric ulcers. This is due to the average smaller opening of the perforation in the duodenum than of the stomach. Also the capacity of the duodenum being less than the stomach, less contents are poured into the peritoneal cavity in the first few hours of perforation. In addition a ruptured duodenal ulcer drains into the more limited region of the right kidney pouch and along the outer side of the caecum, so that a diffuse peritonitis does not occur in the early stage. Therefore, the time factor before operation in duodenal ulcers does not influence the result of operative treatment to the extent it does in ruptured gastric ulcers.

In the table of ruptured gastric ulcers the mortality rate and the average time before operation diminished in about the same proportion, namely, three to one for the two periods. With ruptured duodenal ulcers the mortality rate for the two periods of five years each dropped only from 14·1% to 12·5%, while the time before operation dropped from 19 hours to 6·4 hours. This is no doubt due to the fact that peritonitis becomes general more quickly in rupture of gastric ulcer than of duodenal ulcers.

The treatment of ruptured gastric and duodenal ulcer is essentially surgical. No doubt a few of these patients will recover under rest and medical treatment, but the mortality is said to be 95%. Good results will be almost wholly dependent upon the operation being performed soon after the perforation has occurred. The improvement of mortality rate of the last five years is due to the reduction of time before the abdomen is opened. Those who have died when operations have been carried out within eight hours of perforation, have had a large perforation with immediate flooding of the peritoneal cavity with pints of fluid and solid food.

When once a diagnosis of perforation has been made, the patient should be given an hypodermic injection of morphine to relieve the pain and subsequent shock and also to arrest the movements of the peritoneal surfaces. On no account should the surgeon wait for the collapse to pass off; the patient should be rushed to the operating theatre with the minimum of delay.

The abdomen should be opened through the *linea alba* above the umbilicus. Entrance here is quick and there is less likelihood of persisting infection of the wound than when the rectal sheath is opened. Gas and a quantity of pale yellowish semi-mucoid fluid will usually be discovered which can be mopped away with moist abdominal pads or by a sucker. The perforation is usually easy to find, but the surgeon should remember to search for other perforations. In two of the cases reported a double perforation was found, one at the operation, the other *post mortem*.

The perforation is closed by three mattress sutures of chromic gut. I prefer needles into the hollow end of which the end of the suture is inserted and fixed for gastric sutures. The stitches should be inserted through the healthy wall of the organ, well away from the ulcer to avoid tearing through when tension is applied, which occurs when placed in the œdematous tissue immediately around the ulcer. There is no difficulty as a rule to find a handy tag of omentum which can be stitched over site of suture. With ulcers of the duodenum the two omenta may be brought together over the suture line to secure a covering for it. The ulcerated area should be well inverted, even by a second row of sutures, if thought necessary. In rupture about the pylorus or in the duodenum this will probably obstruct the lumen, but it is of no account for a posterior gastro-jejunostomy is next to be done. I personally prefer to use two fixation sutures in doing anastomosis of the stomach or bowel rather than clamps. My reasons for this are:

1. It is better and safer surgery to control all hæmorrhage by ligature, if necessary, rather than to trust to its arrest by the sutures on removal of the clamps.

2. The immediate anastomotic area requires all its blood supply to bring about quick and healthy union. The crushing action of the clamps must cause a block in many small vessels supplying that area. Might this not be a factor in the production of ulceration at the margin of the stoma?

3. The two fixation sutures, situated as they are, just beyond the extremities of the suture line when tied and left in position, prevent any kinking or pull at the union between stomach and gut.

The abdominal cavity is then quickly dried; all fluid and food are removed with moist gauze sponges, with the aid of the mechanical sucker if much fluid is present. The peritoneal cavity should never be flushed out with saline solution to cleanse it, for no measure is surer to make the peritonitis diffuse.

A small suprapubic opening is made through which a large split tube is inserted down into the pouch of Douglas; here all the fluid will drain, especially when the patient is nursed in the upright position.

In ruptured duodenal ulcers, when the opening is small and the amount of fluid escaped is not large, a drainage tube is placed in the lower part of the right kidney pouch instead of the suprapubic drain. It will not be necessary in most cases to insert a drain through the upper wound down to the suture line of the perforation. The wound is then rapidly closed and the patient returned to a warm bed and placed in Fowler's position.

The advisability of performing a gastro-jejunostomy at the time of operation is one that may be open to discussion. Personally I am of the opinion that in all cases of ruptured gastric or duodenal ulcer a gastro-jejunostomy should be carried out except when the condition of the patient is very bad; in these circumstances the gastro-jejunostomy must be performed at a later date. My reasons are:

1. The risk to the patient by performing a gastro-jejunostomy is not increased in most cases. Those patients whose condition is too bad to justify any prolongation of the operation, usually die. Only one death occurred among fifteen patients who were subjected to closures of perforation and gastro-jejunostomy in the gastric ulcer series and no deaths among forty-one patients in the duodenal ulcer series. No doubt the graver the condition of the patient, the more frequently would the quicker procedure of closure only be performed; the above figures show that gastro-jejunostomy is a safe measure for immediate recovery and it is certainly necessary for relief of future symptoms.

2. Gastro-jejunostomy must be accepted as an essential step in bringing about the cure of the ulcer, either at the time of the closure of the perforation or as a subsequent operation. A few months ago I operated upon a man for perforated ulcer of the duodenum who eight years previously had an operation performed for a similar condition, when the ulcer was oversewn. Another man also had a second rupture of a pyloric ulcer; closure only of their ulcer had been previously performed.

3. There is much less chance of any leakage from closure of a perforated ulcer when a gastro-jejunostomy has been performed, for there is a ready passage for the contents of the stomach and increased intravesical pressure is thus avoided.

In addition, food by mouth can be taken soon after recovery from the anæsthetic; consequently a smoother and easier recovery of a patient is insured when a gastro-jejunostomy has been done.

4. A gastro-jejunostomy prevents the possibility of any obstruction when a pyloric or duodenal ulcer has been so unfolded as to occlude the lumen. For this reason a more secure closure may be carried out without any thought for the patency of the lumen.

In *The British Medical Journal* of September 25, 1926, Mr. H. J. Peterson in opening the discussion in the Section of Surgery at the Annual Meeting on the place of gastro-jejunostomy in gastric and duodenal surgery stated: "In my opinion there is further indication for gastro-jejunostomy—namely, that it should be part of the treatment of a perforated gastric or duodenal ulcer. I am convinced that it is a life-saving measure. When performed in addition to suture of the perforation and drainage, convalescence is smoother and more uneventful and the patient's recovery is more speedy and more sure."

Recently methods of treatment by resection have been adopted on the Continent and are said to have given excellent results. Free resection of the stomach and duodenum is carried out, either a Bilroth I. or Bilroth II. operation. Such operations could only be performed in cases with early small perforations for even with simple excision of an œdematous ulcer many precious minutes are consumed often with not unappreciable loss of blood. Apparently on the Continent perforated ulcers are not operated upon as early as elsewhere, for Stoepffel states that he has obtained the excellent results of a 15% mortality rate with free resection as against a mortality rate of 49% with other methods.

In the cases recorded here there were two excisions of ruptured pyloric ulcers and eight of duodenal ulcers with no deaths. Nearly all these operations were a modification of Finney's operation. These methods should be reserved for the favourable cases; closure by infolding of the ulcer followed by gastro-jejunostomy when possible, gives the best results in all cases.

There is no doubt that a decrease in the mortality rate of perforated gastric and duodenal ulcers of the future will depend more upon the early recognition of these conditions and increased facilities for immediate operation than upon improvement of our methods of operation.

MR. H. S. NEWLAND (Adelaide) congratulated both speakers on their interesting papers. The idea of making the discussion a surgical pillory was a very interesting one and he thought that it was a good idea to record unsuccessful cases. He recited his own. In the first place there were those conditions in which there was no ulcer at all. This was a fatal error. The symptoms might be aggravated after the operation. He had been guilty of this once twenty years before, but only once. He had had to undo the gastro-enterostomy as the symptoms were progressing. If necessary he opened the stomach to find the ulcer in difficult cases.

There was a case of pyloric occlusion by a silk suture. This patient had progressed well for a few months, but had come back for further treatment. There was an annular stricture at the pylorus. The condition had been treated by pylorectomy.

After gastro-enterostomy had been performed for a perforated duodenal ulcer, pain had recurred but to the left. A jejunal ulcer had not been found by X ray examination. Another surgeon had undone the gastro-enterostomy and had carried out a gastro-duodenostomy; but the symptoms persisted. He had operated and found that there was a recurrence of the duodenal ulcer. Where there was hæmorrhage from the ulcer in addition to gastro-enterostomy the ulcer should also be attacked.

SIR DONALD MCGAVIN (Dunedin) added his tribute to the extraordinarily interesting and stimulating papers. One point had not been sufficiently emphasized; it was usually held that gastro-jejunal ulcer occurred in 2% of patients subjected to gastro-jejunostomy. In Devine's series the frequency was 4%. This ulcer was usually said to appear within two years. The operation of gastro-jejunostomy had been performed one hundred and ninety-two times at the Mount Sinai Hospital, New York, in nine years for duodenal or pyloric ulcers. The patients had been most thoroughly followed up. All the patients had been seen by three surgeons attached to the hospital. Of these, 34% developed gastro-jejunal ulcer, 18% of these were confirmed by operation and 16% by clinical and X ray examination. If these figures were approximately correct, it followed that gastrectomy was the better operation for gastric and duodenal ulcers. The operative mortality of duodenal ulcer was high. In this series Pagenstecker's thread had been used for the outer row of sutures. When the pylorus was occluded, duodenal ulcers did not appear in a greater proportion than when the pylorus was left untouched. After a posterior gastro-enterostomy had been done, gastro-jejunal ulcers appeared more than five years after operation.

After gastro-jejunostomy the patient should be kept well alkalinized, perhaps for years; he should be put on a diet which did not contain acid.

DR. T. D. M. STOUT (Wellington) said that it was a joy to get the fresh ideas of Devine and to try to assimilate these in New Zealand. He proposed to comment on some

of the problems of the treatment of gastric and duodenal ulcers as they arose in the comparatively small scope of their hospital practice in New Zealand. He would not attempt to elaborate the subject or to suggest any fresh development. He considered that it would be wiser for them to be conservative and to follow the work and technique of more experienced surgeons, but to be anxious to adopt any new ideas that might be proved to be sound in practice elsewhere.

Their first problem was that of accurate diagnosis. He considered that they had been suffering from Moynihan's original brilliant elucidation of the symptomatology of duodenal ulcer. They had been expecting too many duodenal ulcers and had been diagnosing the condition far too often.

They had learnt that symptoms seemingly typical of duodenal ulceration could be caused by pathological conditions elsewhere in the abdomen, especially in the gall bladder, and also by conditions not necessarily involving any gross pathological changes. They also knew that hæmatemesis could arise in many conditions without any definite lesion in the stomach or duodenum. His belief, however, was that in ulcer there were more severe symptoms and the illness much more evident. The pain caused by ulceration was as a rule much more distressing.

The X ray diagnosis of duodenal ulcer could not be said to be absolutely reliable and he suspected that the radiologists were inclined to see too many ulcers, as they did not err as a rule by diagnosing a definite chronic ulcer with well developed clinical symptoms. The X ray diagnosis of gastric ulcer was on a surer, but not yet certain footing. Their surgical treatment was preceded as a rule by a period of rest and medical treatment based on Sippy's method.

In regard to operation, he emphasized the seemingly unnecessary preliminary of demonstrating the ulcer, especially in the duodenum. He believed that too many ulcers were diagnosed. He claimed that the ulcer was often taken for granted at the operation itself. His Scotch ancestry demanded that he should see or feel the ulcer and if he was uncertain, he did not hesitate to open the stomach to feel the ulcer, if the local signs were not quite definite. He believed that in New Zealand the insistence of proving at operation the presence of a definite pathological lesion before any surgical procedure was adopted, was not the least important aspect of the question. Having proved the presence of an ulcer in the duodenum, his routine had been to perform gastro-jejunostomy and to leave the ulcer alone. It was a very conservative measure. Was it sufficient? The results in regard to relief of symptoms seemed to be good and jejunal ulcer did not appear to be a common sequel with modern technique.

In the next place he raised the question whether it was necessary to treat the ulcer. Theoretically it appeared to be the correct procedure, but practically it seemed that if the treatment were to be effective, there would be an added danger to the patient, as the tissue of the duodenum was not the healthiest tissue to manipulate.

A more elaborate operation than gastro-jejunostomy, such as Mr. Devine had suggested, might prove to be more satisfactory, but in gastro-jejunostomy they had a safe and tried procedure. They might be pardoned if they refused to dispense with it without very mature consideration.

In regard to the technique, an adequate opening, no excess of jejunum above the anastomosis and no kinking were the essentials. The exact angle of the opening in the stomach seemed to be immaterial, as experienced surgeons differed in their methods in this respect.

The prevention of hæmorrhage was the most important part of the operation; every vessel seen during the anastomosis should either be tied or underrun and the stitches should be set close enough together and kept taut.

With regard to gastric ulcer he believed that radical measures were indicated. They knew that local excision by itself was unsatisfactory and that gastro-jejunostomy had to be combined with this procedure before they could be at all confident of their results.

The development of the Pólya operation as modified by Moynihan seemed to have solved satisfactorily one problem in the meantime till they obtained more information in regard to the origin of the disease. The operation could be performed by an average surgeon with comparative safety. The results seemed to be extremely satisfactory.

He considered that they could discard local excision, some resections and especially operations aiming at the reconstruction of the gastro-duodenal channel. The large saucer ulcers extending towards the cardia, which were inoperable, should be dealt with by jejunostomy combined with anterior gastro-jejunostomy.

He had been interested in the question of hæmorrhage from gastric ulcer since their pathologist had produced three specimens in one month from patients who had died in the hospital from this complication. In two of these specimens the coronary artery was lying open in the floor of the ulcer, and in the other the splenic artery was similarly eroded. They had held the opinion that hæmatemesis seldom caused death if treated conservatively, but there were these three patients in one month in one hospital, one of whom had had a previous hæmorrhage. Should they operate on these patients when they were bleeding? If this had been done, the patient with the coronary lesions, which were easy of access, might have been saved. In any case the conclusion was obvious that after a hæmorrhage operation should not be long delayed. As regards perforation, he was satisfied with closure of the perforation and drainage. There appeared to be some definite relief to the ulcerating process produced by the perforation and the performance of gastro-jejunostomy did not seem to be indicated for the immediate treatment of the condition. Its performance was required for the future benefit of the patient and so seemed definitely contraindicated if much extra risk was entailed by its performance.

DR. P. STANLEY FOSTER (Christchurch) said that his remarks might savour of reiteration. He had gone into the case records of the Christchurch Hospital from 1919 to 1925. In that time there had been thirty patients with perforated ulcers, nineteen with gastric and eleven with duodenal, with ten deaths. This list included three patients who had been moribund on admission and for whom nothing could be done. There was also a child one month old in whom the condition was found *post mortem*. If these patients were excluded the mortality rate is less than 25%. This compared favourably with the statistics of the series given in Choyce's "System of Surgery."

In the majority the patients were between the ages of forty and sixty; the oldest was seventy-eight and he recovered, the youngest was one month of age. Many of the patients were operated on within ten hours of the onset of symptoms, three were operated on after the lapse of twenty-four hours and all died; one who was operated on after twenty hours, recovered. In the majority drainage was employed and the ulcer oversewn. In some the appendix had been attacked first. In five gastro-enterostomy had been performed at the time of the original operation, with one death.

In regard to the after results of gastro-enterostomy, twenty-five patients had been traced; twenty had reported that they were quite well; in two there had been no improvement. In one diabetes had developed six months afterwards; the patient was still under treatment, the stomach condition was apparently good. Two had some discomfort occasionally.

Thirty-eight of the patients with gastric ulcers had been operated on with two deaths. The ages were between thirty and sixty, but many were between fifty and sixty, males predominated in the ratio of three to one. Symptoms had lasted over a period of years. Pain had been constant and vomiting frequent. Hæmatemesis had occurred in 10%. In a considerable proportion the symptoms had been atypical. One patient belched a gas apparently of the methane series which was inflammable. He could blow through a glass tube and light the gas coming through the end. He had discovered this phenomenon while lighting his pipe, when he had burned his whiskers. Dr. L. E. Barnett confirmed the statement.

X ray investigations had revealed the ulcer in twenty-five out of twenty-eight patients examined. The treatment had been by operation. Gastro-enterostomy with or without excision of the ulcer had been carried out in thirty patients, with one death due to gangrene of the lungs. Gastrectomy had been performed for six patients with one death from shock. Sleeve resection had been performed twice.

Of twenty-six patients with duodenal ulcer the age of the majority was between forty and sixty; there were twenty males and six females. Every patient suffered from a sort of dyspepsia. Of the typical duodenal type there were eleven cases. Hæmatemesis appeared in three patients, three ulcers had previously perforated.

Gastro-enterostomy had been performed on twenty-four patients without any deaths. One patient with repeated bleeding had a very large ulcer eating into the pancreas. This patient had collapsed on the table and had died subsequently. He had had repeated transfusions previously. In one case the ulcer had been oversewn and appendicectomy done, but no anastomosis. This patient had reported that no improvement had resulted.

One patient discharged from a medical ward "cured" had returned the same night with a perforated ulcer. He had recovered.

Dr. Foster did not think that they had as many cases of jejunal ulcer as appear in the New York series. He did not believe that gastrectomy was a logical procedure in all cases of gastric ulcer.

PROFESSOR F. GORDON BELL (Dunedin) wished to make one or two constructive points. In the great majority of cases of duodenal ulcer a gastro-jejunostomy should be done. In suitable small early ulcers of the duodenum occasionally it was possible to excise the ulcer. The patients should receive careful alkali treatment afterwards. The idea was to get rid of the ulcer and put the patient under medical treatment. In gastric ulcer the surgeon should adopt an intermediate position. Gastro-jejunostomy was the procedure for the simpler uncomplicated ulcer, as the punishment far exceeded the crime if an extensive partial gastrectomy was performed. Partial gastrectomy was indicated in the large, callous, indurated ulcers. Although gastro-jejunostomy was an essentially satisfactory procedure, yielding a cure in two-thirds of the patients, it was unsatisfactory in 25%. This percentage could be reduced with careful after treatment. It was common to find that at the time of leaving hospital patients were told they could eat anything, but their diet should be selected and alkalis given. He gave his patients a copy of directions as to their future mode of life. In Mr. Devine's most fascinating opening address the defects with which he had dealt, were to a large extent cardinal ones, emphasized by the high priests of gastro-jejunostomy. They were the long loop, the kink and the stoma which was placed too near the pylorus. If these points were attended to, there would be fewer unsatisfactory results. He had recently operated on two patients with gastro-jejunal ulcer in hospital. In one there was a perforation after a partial gastrectomy and in the other a perforation after a gastro-jejunostomy performed twenty years previously. The latter patient had had relief for thirteen years and had then got a recurrence of the symptoms of the duodenal ulcer. There must be some local factor which influenced the large incidence of gastro-jejunal ulcer quoted by continental surgeons and probably the smaller Anglo-Saxon estimate was nearer the mark. Probably this could be reduced by more careful after treatment. Lastly as regards perforation, it was most important and as a teacher he wanted to say particularly that gastro-jejunostomy must not be added to the initial treatment. If this principle were to extend in Australia and in New Zealand, as many of these patients had perforce to be dealt with by comparatively inexperienced surgeons, more patients would be lost than if the ulcers were merely sutured.

SIR GEORGE SYME (Melbourne) said that it seemed presumptuous for him, retired from practice, to discuss work in which men were actively engaged. The advantages were that he had had a longer experience of the effects of these operations. Recently he had been asked to see a patient on whom he had operated for pyloric ulcer twenty years previously. After gastro-jejunostomy the patient had recovered and had remained in perfect health until later a recurrence of symptoms had appeared. He had seen a great many patients with conditions of the same kind. He was sceptical as to whether a gastro-jejunostomy cured an ulcer. He would like to endorse most emphatically the necessity for after treatment of these patients. Such a patient could not eat or do anything he liked. He was afraid that like Devine he had had to undo the gastro-jejunostomy many times. When Professor Senn had visited Australia, he had asked the speaker if he had performed gastro-enterostomy on many occasions. He had said that he was afraid that the operation was going to be greatly overdone. It was so easy that anybody could do it. It was apparently simple, but not so simple as the average operator thought, unless every effort was made to select the site and to adopt the proper procedure.

There was something that they had not discovered with regard to the causation of these ulcers. Gastro-jejunostomy at the time of the first operation was absolutely wrong. If they wanted to carry out a successful gastro-enterostomy, the patient must be thoroughly examined before the operation was performed.

DR. R. CAMPBELL BEGG (Wellington) wished to remind the members of Hurst's work in which he had shown that a duodenal ulcer was associated with a hypertonic stomach and a gastric ulcer with a hypotonic stomach.

DR. L. E. BARNETT (Dunedin) had been practising gastro-enterostomy since the days when Murphy's button was used. He had watched the development and had changed his methods from time to time. He pointed out that the stomach and duodenum as seen in a diagram were different from what they were in the body. The stomach varied in size and position and when it was turned back after a gastro-enterostomy, it often became twisted and kinked. He had given up the no-loop operation, because he believed that a certain amount of play was necessary to allow of the up and down movements of the stomach. Some inflammatory swelling had followed in a few patients around the opening of the mesocolon due he thought to contamination at the time of anastomosis. A suction tube would prevent this. He had had to perform lateral anastomosis between the afferent and efferent loops to save the patient's life. A gastro-enterostomy must leave the patient better, but he had an abnormality and was not as good as before. Mr. Devine had mentioned that he removed the appendix through a stab incision in certain patients. Dr. Barnett had tried this years ago and had given it up. He believed that a paramedian incision could be made from the enciform cartilage to the *symphysis pubis* and the patient's abdomen would be as good as before operation.

DR. CARRICK ROBERTSON (Auckland) wished to take the opportunity of thanking Mr. Devine for finding pigeon holes and classifying results after gastro-jejunostomy. He quoted an interesting case of a man with a bad duodenal ulcer which had perforated before. He had recovered from this. He was a sheep farmer and on account of symptoms had to give up his occupation and live in town. He used to haunt Mr. Robertson to tell him of his troubles until he became a positive nuisance. Eventually he left Auckland and resumed sheep farming. A year or so later he turned up again, cured of all his previous trouble. This was a case of neurasthenia induced by the necessity of having to give up his previous occupation. Another patient on whom he had operated, had his abdominal cavity covered by millions of tubercles; two or three of these had been excised and the pathologist thought they must be sutures. However, a small ulcer had perforated; the tubercles were evidently small pieces of foodstuff that had escaped.

DR. C. M. GREENSLADE (Dunedin) believed that on the whole it was better not to do a gastro-jejunostomy in the presence of acute perforation. The operation might not be required. It was better to do this operation on an abdomen which was not the seat of peritonitis. He found that it was quite sufficient to oversew the ulcer. He was not frightened of obstructing the lumen of the stomach or duodenum, because the perforation could always be plugged with omentum if the lumen of the bowel was unduly obstructed. He had operated on a patient six days after closing a perforation. At the first operation there had been a considerable degree of œdema around the perforation in the stomach, but at the second operation the place where the ulcer had been, was not at all obvious; all the œdema had disappeared. An operation was performed on this patient for hæmorrhage from a kissing ulcer which had eroded a small vessel in the pancreas. He looked upon gastric and duodenal ulcer as a complaint associated in a large

number of cases with a focus of infection in some other part of the body. It might be chronic appendicitis, pyelitis, pyorrhœa, chronic tonsillitis, gall bladder disease or pelvic trouble in women. He preferred at the first operation merely to close the ulcer and in certain cases to drain. During convalescence the gums and any obvious septic foci were treated. After from one to three months a second abdominal operation was performed. The appropriate gastric operation was then undertaken; this might be a partial gastrectomy, a duodenectomy, a gastro-duodenostomy or a gastro-jejunostomy. In every case the appendix was removed. Only a year previously he had had to remove a gangrenous appendix from a young woman who had had a partial gastrectomy only three months before. On another occasion he had found a perforation of both the appendix and the duodenum at the same time. In addition any further operative procedures that were necessary, were carried out. He believed that the chance of success in any abdominal operation performed in the absence of peritonitis was much better than if it were done when the peritoneum was suffering from the irritation resulting from the perforation.

DR. F. S. BATCHELOR (Dunedin) asked Mr. Devine for his opinion of local excision of duodenal ulcer. He thought it was a good operation, better than gastro-enterostomy and he had been performing it recently with success.

DR. WILBY FISHER (South Auckland) wanted to know in what different cases of disturbed motility did gastro-enterostomy do good. Was lavage any good? He had had one case with good result.

MR. GORDON CRAIG (Sydney) referred to the work of Finney and asked if Mr. Devine had any views upon the operation combined with excision of the ulcer.

DR. J. A. JENKINS (Dunedin) found that after a partial gastrectomy, although there was very rapid emptying of the stomach, there were no complaints.

MR. H. B. DEVINE in reply pleaded only for a better understanding of the principles underlying gastro-enterostomy. He agreed with Professor Gordon Bell and Sir George Syme that gastro-enterostomy was not advisable as an addition to suture of the perforated ulcer. The gastric muscle was often injured from the local peritonitis and an essential requisite of gastro-enterostomy was absent and the extra operation might lessen the patient's chances of recovery. Often the perforations were due to acute ulcer and a gastro-enterostomy was not indicated in these cases. He agreed with Dr. Barnett that too short a loop was very liable to an axial twist and that it had no latitude for alteration of the size of the stomach and was just as dangerous as a long loop. He did not agree with him that an incision in the upper part of the abdomen should be carried far down in order to get a low and adherent appendix. An incision as far as the umbilicus was sufficient for any abdominal work and for the removal of most appendices. The lower post of the rectus had more tone and function than the upper and injury to it should be avoided if possible. Like Sir Donald McGavin, he was surprised at the very high percentage of jejunal ulcer occurring after gastro-enterostomy according to the Mount Sinai Hospital statistics, but he was inclined to accept the British statistics as a better indication rather than the American or Continental because he thought the British surgeon did a gastro-enterostomy based on better physiological principles. Mention had been made of the clear-cut clinical syndrome of duodenal ulcer which Moynihan had described. This clinical picture was often present and there was no ulcer and conversely there was often no definite syndrome and duodenal ulcer was present. In agreement with Dr. Gordon Bell he did not believe in doing gastro-enterostomy in the presence of a hæmatemesis except when there was definite evidence that the source of the bleeding was a chronic ulcer. Hæmatemesis, he thought, was usually due to acute ulcer. He thought that bleeding ulcers had a different ætiology to other ulcers, probably of the nature of and what he had called in his paper "debility" ulcer. General treatment and if this failed a gastric exclusion or a gastrectomy were the indications in these cases.

Many failures after gastro-enterostomy could be minimized or avoided with appropriate treatment, but he was speaking of those cases of gastro-enterostomy which had resisted all forms of treatment.

Replying to Dr. Stanley Batchelor, gastrectomy did not have the unpleasant after effects due to disturbances of gastric mobility that gastro-enterostomy had. This might be attributed to the fact that a "gastro-enterostomized" stomach had two exits which rendered it more liable to errors in the emptying time than a "gastrectomized" stomach with one opening. Anyway it was a clinical observation that gastrectomy was much freer from untoward after effects than gastro-enterestomy. He would do a partial gastrectomy or partial gastric exclusion (Devine) when the duodenal ulcer was very old, callous and especially if it were on the posterior wall.

Mr. Devine thought that the effect of chronic appendicitis in producing reflex dyspepsia and contributing to the formation of ulcer was exaggerated. Most patients on whom he had operated for ulcer, had previously been operated on for chronic appendicitis and in 30% the ulcer had been present at the time.

He agreed with Mr. Gordon Craig that Finney's operation was very useful for certain kinds of duodenal ulcer especially if it were combined with excision of the ulcer. He agreed with Dr. Carrick Robertson, Dr. Campbell Begg and others that the treatment of a preoperative or postoperative acidity was only the treatment of a symptom and that treatment such as alteration in habits and mode of life aimed at the nervous system was more important.

DR. ST. JOHN DANSEY (Sydney) in reply to Dr. Fisher said that he did not employ lavage. It made the peritonitis general. He used a sucker and pads to get the fluid away and drained through a suprapubic incision. He felt that there would be opposition to his statements about gastro-jejunostomy. Up till two years ago he closed the ulcer, but he found that the patients did not come back for the second operation and he thought that the best results were obtained by doing gastro-jejunostomy when the patient was well enough to stand the operation. He did not do it in patients who were very ill. He found that after the gastro-jejunostomy his patients had a better convalescence than those in which the ulcer was merely oversewn.

SECTION III.—OBSTETRICS AND GYNÆCOLOGY.

THE PROBLEMS OF CÆSAREAN SECTION.

By ARTHUR M. WILSON, D.S.O., M.D., B.S.,
Lecturer in Obstetrics and Gynæcology, Melbourne University; Senior Honorary Obstetric Surgeon, Women's Hospital, Melbourne.

THE problems that arise in connexion with a consideration of the subject of Cæsarean section are numerous and very difficult to solve. In this paper I have confined my remarks to the most difficult problem, the selection of the case and to its corollary, the frequency with which the operation should be performed.

I have left untouched many interesting problems, such as the operative procedure and technique, the necessity or advisability of sterilization of the patient, the indications for hysterectomy and so forth.

Before dealing with the selection of the case, the following facts about the Cæsarean operation must be remembered:

1. There is a definite operative risk. The mortality of "non-suspect" Cæsarean section performed on healthy mothers at a suitable time and under good conditions is at least 1%, that is at least five

times greater than the mortality in normal confinements (2 per 1,000).

2. The operative risk is increased in the "abnormal" case. The mortality of all patients subjected to Cæsarean section is at least 7%, that is fourteen times greater than the mortality in all confinements (5 per 1,000).

3. The mortality in infected patients is at least 20%.

4. No operation in the realms of surgery is more likely to be followed by a ventral hernia.

5. At least 4% of all Cæsarean scars rupture at a subsequent confinement.

6. The performance of the operation undoubtedly limits the size of the family.

Unfortunately, the operation, though far from being devoid of risk both immediate and remote, is comparatively easy to perform. If all goes well, it successfully and dramatically terminates a pregnancy or a labour which has been causing the obstetrician much anxiety.

Consequently there must be some tendency to minimize the dangers and to perform the operation perhaps unnecessarily and thus terminate the case and so allay, at least temporarily, the anxieties of the relatives and the obstetrician.

Before deciding on the necessity for operation in any particular case many factors must be considered. These include the age, social condition, the parity and the general condition of the mother, the viability, vitality and the value of the particular child to its parents and also its undamaged and well-formed (as contrasted with malformed) condition. The effect of the operation on the subsequent pregnancies must always be thought of, especially if the operation is being performed for some "non-pelvic" condition.

Before an ultimate decision is arrived at, the patient and her relatives should always be fully apprised of the facts and of the different methods of treatment and their risks; indeed in many cases the final decision must rest with the people concerned.

In certain types of case, notably in those where attempts at delivery have already been made or where there is risk of infection, the operation is so serious that it is doubtful if one practitioner alone should accept the responsibility for its performance.

Difficulties and anxieties are much more prone to occur in dealing with well-to-do and well-known people, but the obstetrician should never allow his anxiety to bias his judgement. On the other hand it is equally reprehensible to deny the necessity of the operation in a particular case just because one is of the opinion that far too many Cæsarean sections are done.

Realizing only too well all the difficulties that beset the path of the obstetrician, I have set out in detail the various indications which may help toward the solution of the difficult problem of the selection of the case.

However, I should like to stress here that though the variety of indications is very great, yet it is only the rare individual case in each variety that is best treated by section.

The clinical types of operation may be subdivided as follows:

(i) Elective, that is when it has been decided some time before the onset of labour to perform a Cæsarean section;

(ii) delayed elective, that is when it has been decided to give the patient a "trial of labour" before the operation is finally decided upon;

(iii) emergency, that is when some acute obstetrical emergency has arisen before or during labour and the operation is performed in the interests of the mother or the fœtus or of both.

Elective operations are required for extreme degrees of pelvic contraction, insuperable obstruction by tumours, undilatable atresia of the cervix and vagina, after a previous Cæsarean section for contracted pelvis, when the patient has lost her first two or more children from previous dystocia (the problem of the third baby), constitutional complications of pregnancy.

Delayed elective operations may be necessary in the presence of minor degrees of pelvic deformity, obstruction by tumours.

Emergency operations may be performed for obstructed labour in contracted pelves, obstructed labours due to presence of tumours, certain cases of eclampsia, certain cases of accidental hæmorrhage, certain cases of *placenta prævia*, certain cases of presentation of the cord, certain cases of malpresentations.

Elective Operations.

Extreme Degrees of Pelvic Contraction.

If the *conjugata vera* is not more than 6·3 centimetres (two and a half inches), any other line of treatment cannot be considered if the patient has gone to full time. A high craniotomy is extremely difficult and dangerous in such a case. Nevertheless it is extremely rare to find in Australia such a degree of pelvic deformity.

Insuperable Obstruction by Tumours.

In regard to the uterus a malignant disease of the cervix, of course, demands a pan-hysterectomy as soon as diagnosed.

A large fibroid in the cervix or lower uterine segment is usually an absolute indication, the operation being followed by a myomectomy or a hysterectomy.

If in the ovary when the tumour is fixed in the pelvis, the indication is absolute, the operation being followed by removal of the tumour.

It is required for tumours of the pelvic bones.

If a tumour of the rectum is malignant and is accompanied by a recto-vaginal fistula, a hysterectomy should be performed owing to the great risk of subsequent puerperal infection.

Undilatable Atresia of the Cervix and Vagina.

Undilatable atresia of the cervix is seen only after an extensive resection of the cervix with subsequent formation of much scar tissue. Even then the cervix can usually be dilated if the obstetrician exercises

enough patience. If the atresia is complicated by some other abnormality, such as *placenta prævia*, the indication may become absolute. Cæsarean section should never be necessary for the so-called functional rigidity.

Undilatable atresia of the vagina is also seen after extensive scarring from some previous ulceration.

After a Previous Cæsarean Section for Contracted Pelvis.

There is much truth in the axiom: "In contracted pelves once a Cæsarean, always a Cæsarean." The moral of this is to be extremely careful about the selection of the case before doing the first Cæsarean section. Herein also is the great disadvantage of Cæsarean section contrasted with pubiotomy. It is always an anxious time for the obstetrician when he conducts a labour in a patient upon whom an emergency Cæsarean section had been done previously (such as for eclampsia or *placenta prævia*), especially if the patient has been "morbid" during her convalescence or if the operation has been performed hurriedly under bad conditions.

The operation of pubiotomy has an advantage that in many patients some permanent enlargement of the pelvis is caused and consequently there is practically no anxiety with a subsequent confinement, but unfortunately, whilst believing that a pubiotomy for impaction in the pelvis or at the outlet is a very excellent operation, I have seen some very bad results following on this operation when done for obstruction at the inlet.

Previous Dystocia.

When the patient has lost her first two or more children in childbirth through dystocia, of course, the obstetrician may not regard the indications as being absolute, but nevertheless it requires very much courage to perform an induction of labour in such a case, as in most of these patients, the parents are extremely anxious to have a living child and the mother is, as a rule, quite prepared to undergo the slightly increased risk of the Cæsarean section.

Constitutional Complications of Pregnancy.

Various authorities recommend Cæsarean section with subsequent sterilization for patients with uncompensated cardiac lesions and also with pulmonary tuberculosis. Personally I believe that such interference is unwarranted and subjects the patients to unnecessary risks.

Delayed Elective Operations.

Minor Degrees of Pelvic Deformity.

I would like to emphasize the importance of giving all *primigravidæ* a trial of labour before performing Cæsarean section; also the importance of not allowing these "suspect" cases to go over time (prophylactic induction—Barrington), also the value of attempting to give these patients their "trial" a fortnight or so before time by Watson's method either completely or modified. It must be remembered that all first labours are really "trials" and if the woman has failed to the extent of having required assistance with forceps and as a result of the dystocia has had either a dead fœtus or an infant with some birth injury, the question of an induction at thirty-six weeks must be seriously considered. Indeed, I believe that in this type of case lies the greatest field for the induction of labour in contracted pelves.

In the mechanism of birth it must always be remembered that many factors are concerned. The proportion between the fœtal head and the mother's pelvis, the presentation and position, the mouldability of the fœtal skull, the dilatability of the maternal soft parts and the strength of the uterine contractions are all factors of considerable importance. Consequently the obstetrician must not be influenced too much by the pelvic measurements (both internal and external). Contractions of the *conjugata vera* under nine centimetres (three and a half inches) are uncommon here and even with a diameter of this size, a woman having strong contractions will drive a normally developed fœtus through the pelvis. Unfortunately we have no method of estimating what will be the force of the uterine pains. I, therefore, urge that all *primigravidæ* should be given a trial of labour. With a properly conducted trial of labour Cæsarean section done after a "failure" is not a very risky operation. Here I should like to stress three conditions that may disturb the obstetrician.

The non-fixation of the fœtal head in the last month of pregnancy in a *primigravida*. This sign is undoubtedly a danger signal, but no more. It may occur without any disproportion. Excess of *liquor amnii*, a low implantation of the placenta, a posterior position, an atonic uterus may all be responsible for this sign. Nevertheless such a case does require investigation by Müller's, Munro Kerr's or Fitz-Gibbon's methods. Abdominal palpation to ascertain if there is any over-riding of the head, especially after getting the patient to sit "half-up," is of great value. Even if some disproportion is considered to be present, the patient should be placed under good conditions and given a trial of labour.

In dealing with patients considered to have a contraction of the outlet Cæsarean section should rarely be necessary. Contractions of the outlet, not associated with some contraction at the inlet, are uncommon and are usually found only with extremely deformed pelves. In such a case, if the head does pass the brim, the condition is much better treated by a pubiotomy.

The height of the patient, especially if under one hundred and fifty-two centimetres (five feet) may alarm the obstetrician. These small women often accomplish their labours satisfactorily and they need only the ordinary methods of examination and treatment.

Here may be mentioned the various arguments for and against the induction of premature labour as contrasted with Cæsarean section in the presence of minor pelvic contraction. Whilst being very greatly impressed by the value of induction in *multigravidæ*, I feel very pessimistic about its value in *primigravidæ*. My experience has forced me to agree with Whitridge Williams that much better fœtal results are obtained by allowing all *primigravidæ* to go to full-term and then, if necessary,

delivering them with forceps and performing craniotomy should it be impossible to deliver the fœtus with forceps.

Better results still are obtained by giving the *primigravidæ* a trial of labour and if this fails, by being prepared to perform Cæsarean section or pubiotomy. It is really astonishing how seldom it fails.

The great objection to an induction of labour is the fœtal mortality and the neo-natal death rate.

The advantage of induction is that the patient may have any number of inductions performed without serious ill-effects. In each particular case the advantage must be contrasted with the disadvantage.

Herbert R. Spencer, in contrasting inductions with Cæsarean section, records a fœtal mortality of 11% in 113 labours and no mention is made of neo-natal deaths. Whitridge Williams quotes several series, in all of which the fœtal mortality was over 12% and with a similar figure for the neo-natal mortality.

A method of treatment with such fœtal death rate does not commend itself to me; to quote his words: "It appears that intelligent expectant treatment necessitates the more frequent employment of radical procedures, but at the same time definitely reduces both fœtal and maternal mortality."

At the Melbourne Womens' Hospital during the year 1925-1926, nineteen elective and delayed elective Cæsarean sections (including nine repeats) were performed for contracted pelvis without any fœtal or maternal mortality (only two of these women were *primigravidæ).* During the same period eight inductions (one in *primigravida* and seven in *multigravidæ*) were performed for the same condition, without any maternal or fœtal (including neo-natal) mortality.

Here may be mentioned the problem of the second baby (the first being dead born). It would undoubtedly be in the patient's best interests if she engaged the same doctor for her second confinement, but unfortunately she usually goes elsewhere. The second doctor should spare no efforts in obtaining an exact history of the happenings at the first confinement and her first doctor should not have any hesitation in giving the required information and should withhold nothing that might be of value to his colleague. Particularly it must be ascertained if there was any sign of severe disproportion, whether the labour was premature, full-time or over-time, whether the position and presentation were normal, whether the labour was long and how long, what was the cause of the fœtal dead birth or neo-natal death and what was the weight of the baby. Sometimes these details are not sought and I regret to say that occasionally they are withheld.

Too often is the loss of the first baby regarded as an absolute indication for a Cæsarean section for the second. The responsibility of the obstetrician is great, but he should not let it overshadow his judgement. It is well to remember that if the first baby has been extracted without mutilation, at least 75% of patients will deliver themselves either spontaneously or at any rate with the aid of low forceps. The large majority of the remainder would be well treated by an induction at thirty-six weeks; the remainder certainly should not be subjected to Cæsarean section without a trial of labour.

When labour is obstructed by a tumour of the uterus the patient requires careful watching, if it is thought that the patient may have some dystocia caused by the presence of the fibroid, though it has been decided to give her a trial of labour. Often the patient is an elderly *primigravida* and it may be her first and only pregnancy and no risks can be taken with the fœtus. If a malpresentation is produced when labour starts, it is wiser to perform Cæsarean section at once.

If the tumour is of the ovary and there is any doubt that it will not rise out of the pelvis, it is unwise to give the patient a trial of labour. A few days before the onset of labour is expected the patient may be given an anæsthetic and an attempt should be made to push it out. If it is impossible it is wise not to give the patient a trial.

Emergency Operations.

Obstructed Labour in Contracted Pelves.

It is when labour is obstructed by contraction of the pelvis that most fatalities occur and consequently all the alternative modes of treatment must be carefully considered and all the risks and dangers laid before the relatives.

As a general rule, it may be stated that for each hour the operation is delayed after the membranes have ruptured, the maternal mortality is increased by 1%, that each vaginal examination increases it by 1%, that attempts at forceps or other modes of delivery by 10% to 15%, that the presence of an offensive discharge by 20%. Of course, no rule is absolute and the risks previously mentioned depend largely on by whom and how the various interferences have been conducted. Also it must be remembered that the fœtal mortality in these cases, when attempts at delivery have been made, is at least 25%. It therefore behoves the obstetrician, before performing Cæsarean section in a case of obstructed labour to consider whether the patient would run less risk if some other line of treatment should be adopted, such as craniotomy, version or pubiotomy if the necessary indications for their performance are present. In addition, if he decides to perform Cæsarean section, he must carefully consider which type of operation he will perform and whether it should be followed by a hysterectomy.

Personally I think that it is only in most exceptional cases that Cæsarean section should be performed if the membranes have been ruptured more than twelve hours.

Once more, should the signs and symptoms of a failure of a trial of labour be recognized long before any tonic contraction of the uterus sets in? Too often, though these signs are present and well marked, the optimistic obstetrician attempts a line of treatment which is foredoomed to failure and the prognosis is as a result made ever so much more serious.

Obstructed Labour Due to the Presence of Tumours.

Obstruction caused by tumours is also met with amongst the emergencies. The indications, of course, are to perform Cæsarean section and then to treat the tumour in an appropriate manner.

Certain Cases of Eclampsia.

Statistical survey undoubtedly proves that much better results are obtained in the treatment of eclampsia by conservative measures. The series presented by Professsor J. C. Windeyer at the last Congress demonstrated in a remarkable way the value of conservative treatment. He had only four deaths among a series of 104 patients. At the Melbourne Women's Hospital last year there were three deaths in thirty-eight patients, all being treated conservatively. Of the three deaths, one occurred immediately on admission, one within half-an-hour and one within three hours. The fœtal mortality was 36%.

Obviously cases of eclampsia should but very rarely occur in a properly conducted private practice. The extreme fulminant case is very uncommon. Too often is it assumed that because a patient looks well and has no œdema that she is free from toxæmia. This is very far from correct. In private practice all cases of toxæmia should be recognized early, treated and if the patient fails to respond (and it is only a small percentage that fails to respond), an induction should be performed.

Nevertheless, in certain cases there is some justification for Cæsarean section. If the patient is not in labour (and especially if she is an elderly *primigravida* and a living child is particularly desired) and if she has had efficient eliminative and drug treatment for about eight hours and has steadily become worse and if she is under a capable obstetrician and in an efficient nursing home, the operation may be considered, but it will be considered necessary only in an extremely small percentage of cases.

In the pre-eclamptic toxæmias, the operation should be unnecessary. Early diagnosis, eliminative and dietetic treatment with an induction of labour if the patient is not responding to treatment, should bring practically all labours to a successful conclusion. However, it may be considered when the blood pressure has risen to some extraordinarily high figure, such as 250 milligrammes of mercury and is still rising in spite of treatment. An additional objection to the operation is the effect on the subsequent pregnancies.

Certain Cases of Accidental Hæmorrhage.

Cases of accidental hæmorrhage are not infrequently encountered. They may be divided into two classes, idiopathic and toxæmic. The former are usually mild and need only expectant or conservative treatment, such as vaginal plugging and the application of tight binders. The latter class is as a rule more severe and is at present distinguished by the presence of albuminuria, but a renal efficiency test would be much more satisfactory. In attempting to classify these cases at the Women's Hospital, Melbourne, according to their severity, we have adopted four signs:

(i) The presence of at least one-quarter albumin in the urine on boiling;

(ii) a dead fœtus *in utero*;

(iii) absence of uterine contractions;

(iv) a temperative of 36·1° C. (97° F.) or under and a pulse rate of 132 or over.

If a patient has two of these signs we regard the condition as severe; if three, very severe.

The very severe cases are extremely dangerous to the mother, the mortality being at least 50%. If the obstetrician is an expert operator and the patient is in an efficient hospital, Cæsarean operation followed by a hysterectomy if the uterus fails to contract holds out quite a good prospect of success. A blood transfusion may be needed and it must never be forgotten that in conservative methods of treatment and also operative measures not followed by hysterectomy, the commonest cause of death is *post partum* hæmorrhage.

Fortunately these very severe cases are extremely rare. During the year 1925-1926 at the Melbourne Women's Hospital, out of forty-one cases of accidental hæmorrhage only two were very severe. Both patients were treated successfully by Cæsarean hysterectomy.

Certain Cases of Placenta Prævia.

Many conservative measures may be employed for *placenta prævia,* such as plugging the vagina if the cervix is not sufficiently dilated to enable the obstetrician to do a bipolar version, rupturing the membranes if there is a lateral *placenta prævia* with a vertex presentation.

Undoubtedly the safest method for the mother and applicable to most cases is a bipolar version without extraction of the child. Unfortunately the fœtal mortality is extremely great and because of this many obstetricians have suggested that Cæsarean section should be done for the sake of the fœtus.

Rarely is the indication for the sake of the mother, though it may be in exceptional cases where a central *placenta prævia* is complicated by a long hypertrophic undilated cervix or with an undilated cervix with considerable organic rigidity or if the *placenta prævia* is complicated by some other condition, such as a contracted pelvis or a toxæmia of pregnancy.

If the Cæsarean section is to be done for the sake of the child, the following conditions are requisite: (i) That the mother should be a "good operative risk," (ii) that the child is alive, viable and not deformed.

It must be remembered that the premature infant in association with *placenta prævia* is not nearly such a "good risk" as a premature infant of the same gestation in the normal mother. It is hard to imagine any worse disaster than to perform an operation such as this presumably for the sake of the child and then to present the mother with a dead, deformed or a weakly premature infant.

This statement applies also to all Cæsarean operations and if there is any doubt whatsoever, an X ray examination would settle the diagnosis.

If an attempt is made to allow the gestation to continue in the presence of *placenta prævia* in order that the child may become more mature, though the wisdom of this procedure is very doubtful, the patient and her relatives should be warned of the great dangers which may arise.

Certain Cases of Presentation of the Cord.

Presentation of the cord in a full-time *primigravida* with a vertex presentation is extremely dangerous to the fœtus. Often some contraction of the pelvis is present and this may provide the indication for the operation. It should be considered for a *multigravida* only in extremely rare conditions. It should never be performed for a prolapse of the cord.

Certain Malpresentations.

The treatment of malpresentations is an extremely difficult problem. Many malpresentations are associated with maternal conditions, so that even if the malpresentation can be corrected, they render the successful extraction of the child very difficult. The possibility of some fœtal abnormalities which may be the cause of the malpresentation, must also be considered.

Each case must be judged on its own merits, but the necessity of Cæsarean section should hardly ever arise if the patient is a *multigravida.*

It should never be necessary for persistent occipito-posterior and face presentations, unless some disproportion is present and in that case the interference is because of the disproportion.

Breech presentations under special circumstances, such as in a *primigravida* over thirty-eight and especially if she has gone over time, may be an indication. In such cases the fœtal mortality would be about 20%. The relatives should be informed of this and they might desire Cæsarean section for the sake of the child. Of course, it is quite obvious that a breech presentation should not be allowed to occur and that she should not be allowed to go over time.

In a *primigravida* an impacted brow presentation is associated in 50% of cases with a contracted pelvis. The fœtal mortality would be at least 50%; therefore, for the sake of the child Cæsarean section may be suggested.

In the case of transverse positions if in a *primigravida* and the child is alive, full-time and not malformed and there is no evidence of twins or hydramnios, it is practically certain that some gross disproportion or pelvic tumour is present; Cæsarean section may offer the best chance of a successful delivery. With a *multigravida,* on the other hand, a transverse position is much more likely to be due to laxity of the uterine and abdominal walls and consequently the operation should never be necessary. If it is done after prolapse of a limb, the maternal mortality will be at least 25%.

The Frequency of the Operation.

Unfortunately, owing to the very great variety of possible indications, it is apt to be overlooked that it is only in the uncommon case in each variety that the patient should be subjected to Cæsarean section. The percentage incidence should always be higher in hospital practice than in private owing to the greater frequency of emergency operations.

In the three years 1920 to 1923 at the University College Hospital, London, in 5,647 deliveries there were thirty-two Cæsarean sections (0·58%).

In the Rotunda Hospital, Dublin, in the year 1923-1924, out of 3,704 deliveries, there were nineteen Cæsarean sections (0·51%).

At the Melbourne Women's Hospital in the year July 1, 1925, to June 30, 1926, out of 3,027 deliveries, thirty-one sections were performed (1%).

The indications were contracted pelves twenty-six, *placenta prævia* one, concealed accidental hæmorrhage two, myomata obstructing delivery two.

Of the twenty-six patients with contracted pelves, nineteen came from our own ante-natal clinic. Of these nine were "repeats," eight had either had previous inductions or had failed badly at a previous labour, two failed after a trial of labour. In this series of cases all the operations, except the two after the trial of labour, were performed before the membranes had ruptured. All mothers and infants survived.

Of the remaining seven patients, three were operated on after the membranes had ruptured, but not longer than twelve hours. All the mothers and children survived. Four were operated upon after the membranes had been ruptured over two days. All were patients with obstructed labours and all were desperately ill. In two patients hysterectomy was performed. In this series three of the mothers died and three children were still-born.

These results demonstrate that good results may be expected in cases where section is performed before the onset of labour, in cases done before the membranes have ruptured and also in cases after a properly conducted trial of labour. When the patient has been in labour for some time, the most important factor in prognosis is the time which has elapsed after the membranes have ruptured.

These cases of obstructed labour constitute our greatest source of worry and anxiety. Many of the patients have had repeated attempts at delivery and are often infected before admission. We believe that these patients should be delivered *per vias naturales,* if necessary after some destructive operation, but on occasions we have considered this impossible and have been forced very much against our wishes to perform Cæsarean section.

We would strongly emphasize the fact that every first full-time labour is really a "trial," that the signs and symptoms of failure of the trial should be recognized early and that if these symptoms and signs are present, the indication is not to attempt to deliver by a high forceps operation, unless the obstetrician is prepared to deliver by other means if this attempt fails.

Of the five non-pelvic cases, all the mothers survived. The two fœtuses in the cases of concealed

accidental hæmorrhage were, of course, dead born. The other three survived.

Hysterectomy was performed in both cases of accidental hæmorrhage and both cases of myomata of the uterus.

It is extremely difficult to state what should be the percentage incidence of Cæsarean section in a public hospital practice, but it certainly should not be over 1%. In private practice the figures will vary greatly, but if it is admitted that the percentage should be not more than one in hospital practice, it should certainly be much less than this in an ordinary private practice.

Potter, of Buffalo, United States of America, (chiefly famed for his advocacy of versions) reports that in 1920, out of 1,113 patients personally delivered, eighty were delivered by Cæsarean section (7·2%) and in 1921 out of 1,130 patients one hundred were delivered by Cæsarean section (8·85%). Apart from the high incidence of the Cæsarean operation, another most extraordinary fact is the large number of women attended personally during a year. It certainly makes one wonder whether, owing to the great number, the requisite amount of time and patience could be given to each individual patient.

J. S. Hibben gives a statistical survey of obstetrics in Pasadena, California, United States of America, during 1924. Of 1,414 deliveries, thirty-one were Cæsarean section (2·2%); he then remarks that "the small number of cases delivered by Cæsarean section is evidence that most Pasadena physicians are practising conservative obstetrics."

The indications for the performance of the operation are worth quoting in full: Contracted pelvis eight, hydrocephalus one, dystocia three, toxæmia three, toxæmia of pregnancy six, tuberculosis one, dystocia (twins) three, exostosis one, premature separation of placenta one, former Cæsarean two, *placenta prævia* three, severe tear of cervix and uterus one, fibrous non-elastic uterus one.

The percentages of the individual practitioners concerned are very interesting. The two men who attended nearly 50% of the total number of women, had an incidence rate of 3·6% and 2·8%. The next man performed Cæsarean section five times with a total number of seventy-two patients (7%); the next three times out of thirty-one (10%); the next three times out of twenty-three (13%); the next twice out of twenty-one (10%); the next once out of nineteen 5·3%); the next once out of one (100%).

In my own practice out of 1,500 patients attended during the last seven years, I performed the operation nine times (0·6%). Of these nine two were performed very early in my obstetrical career; the patients should not have been allowed to get into a condition requiring such drastic treatment. One patient had eclampsia and the other severe albuminuria complicated by an accidental hæmorrhage. Both would have been much better treated by an induction of labour a fortnight earlier.

Of the remaining seven, four *primigravidæ* and one *multigravida* failed after a trial of labour; an elective operation was carried out in one patient. She had lost her first two children and had had Cæsarean section previously (done by me at the Women's Hospital). There was also one case of *placenta prævia* in a *primigravida* almost at full time and complicated by an undilated hypertrophic cervix. This operation was done in September, 1925, and since then out of my last 380 deliveries I have not performed the operation once.

In my consultant practice I have performed the operation seven times. Unfortunately I have no record of the number of times as a consultant that I have advised against the operation, though it exceeds by many times the first named figure.

The indications were: *placenta prævia* four times, toxæmia associated with a contracted pelvis once, impacted brow in a *primigravida* once (the fœtus weighed 5·9 kilograms or thirteen pounds), multiple myomata of the uterus once.

In this series one mother unfortunately died of sepsis. I feel that I made a very serious error of judgement in performing the operation at the hospital where the patient was. I should have insisted on her removal to another private hospital or to the Women's Hospital. All the infants survived.

I have been called as a consultant in many cases of obstructed labours. I have in each instance delivered the fœtuses *per vias naturales*, as I have always greatly feared the risk of infection in these cases.

In my hospital practice at the Women's Hospital, Melbourne, I have performed the operation forty-four times in approximately 5,600 patients under my care (0·78%) with the following results:

The maternal death that occurred in the series of contracted pelvis was due to a pelvic abscess and peritonitis. When first seen the patient had been in labour nearly three days. Her temperature was 39·4° C. (102° F.) and her pulse rate was 140.

Reason for Operation.	Number.	Maternal Deaths.	Fœtal Deaths.	Remarks.
Contracted Pelvis	29	1	1	and 2 neonatal deaths.
Eclampsia	5	1	1	
Concealed Accidental Hæmorrhage	3	0	3	(all followed by hysterectomy).
Obstructing Tumours	3	0	0	(two myomata and one malignant disease of the rectum).
Placenta Prævia	3	0	0	(one neonatal death, fœtus not viable).
Pulmonary Tuberculosis	1	0	0	
All Causes	44	2	5	

She had an impacted shoulder presentation and a well marked contraction ring in front of the presenting part. I attempted to deliver her *per vaginam,* but failed and I then did a Cæsarean hysterectomy; the fœtus died through the attempts at vaginal delivery.

Of the remaining twenty-eight cases many were very interesting. Eight were repeated operations; two patients had lost two children previously at birth; four had lost one child previously; four were emergency cases in which attempts at delivery had been made prior to operation, one failed after an induction of labour. The remainder were practically all *primigravidæ* who had failed after a trial of labour.

THE ABUSE OF CÆSAREAN SECTION.

By Henry Jellett, M.D., F.R.C.P.I.,
Consulting Obstetrician to the Public Health Department, New Zealand.

I want to begin this paper by putting a fictitious state of affairs before you. Let us suppose that every *primipara* has to deliver herself by her own unaided efforts, whether there are complications present or whether there are not and that there are no such things as anæsthetics or analgesics. Suppose again that the only alternative is the performance of Cæsarean section in every case, the operation being performed in the most skilled way and under the most favourable conditions. Finally, suppose that every medical practitioner has the duty of advising and every patient the privilege of selecting the mode of delivery to be adopted. Which mode would win?

Personally, I think that on the ground of humanity, expediency and perhaps the general welfare of both mother and infant, the practitioner would advise Cæsarean section and the majority of patients would select it.

The operation is done. The pregnancy is satisfactorily ended and, at a later date, another pregnancy follows. The mother, as far as her pelvic passages are concerned, is still a *primipara.* The only change from her last pregnancy is that she has a scar in her uterine wall which may or may not be as strong as before the operation. The decision is a little easier and again humanity and expediency and certainly the welfare of mother and child decide. The third pregnancy, the proper decision is quite obvious. If "once a Cæsarean section, always a Cæsarean section" is not true; twice a Cæsarean section is. The fourth pregnancy, a doubt begins to arise, if it has not arisen before, as to whether it is advisable to allow the pregnancy to go to full term, on account of the strain on a much incised uterine wall. It is decided to risk it, but when the operation is done, a sterilizing operation is done too.

I do not think that this is an unfair picture of the state of things that would result if the pregnant woman had to look for delivery either to Nature alone or to surgery. It is easy to understand the increased maternal mortality that would follow.

There is, however, a middle course. It has been evolved through the ages and is known as the art of midwifery. Its object is to assist Nature, to relieve pain, to remove complications and to avoid operative procedures as far as possible. Just as it enables the normal confinement to be ended in the simplest manner, so it enables the great majority of complications to be removed or cured, without resort to surgical procedures with their risks and disabilities.

All this is old and we know its truth. What is the object of repeating it? My answer is that, just as what is everyone's business is no one's business, so what everyone knows is at times likely to be forgotten. I think I may say that today, more than at any previous time, there is a tendency to forget that the complications of labour can be treated most satisfactorily by obstetrical methods and to think that there is a safe short cut that brings our patient and ourselves to the desired end and that it passes through the abdominal wall. The true value of that short cut will I think, be shown by statistics that I shall give later.

I have one great difficulty in writing on the abuse of Cæsarean section and that is that almost everything I can say on the subject has been anticipated by Professor Whitridge Williams, of Baltimore and has been put much better than I can put it. In what I have got to say, however, I am not merely adopting his views. My own have been formed independently, but they coincide with his and consequently it is difficult to avoid reechoing his thunder. Even in 1917 he anticipated the title of this paper. On the other hand it is a very great advantage to have his authority to support my own attitude.

In 1916 when addressing the Clinical Congress of Surgeons of North America, he spoke as follows:

> Unfortunately history shows that advances in the practice of medicine and surgery are rarely attained in a thoroughly rational manner, but that a period of undue enthusiasm, or even of almost reckless abuse, usually precedes the establishment of the actual value of a given procedure.
>
> . . . I believe that we are at present going through such a stage in connection with Cæsarean section.

Again in the last edition of his "Obstetrics" he writes as follows:

> With the increasing perfection of surgical technique and an erroneous idea of the safety of the operation, there seems to be a growing tendency to regard Cæsarean section as the simplest means of coping with most obstetrical difficulties. At the present time I consider that the operation is being abused and that not a few patients are sacrificed to the *furor operativus* of obstetricians and general surgeons who are ignorant of the fundamental principles of the obstetric art. This being the case, the conscientious obstetrician should be particularly careful in the recognition of indications for Cæsarean section.

It would be an easy matter to quote similar opinions presented by other writers, but I think Williams's authority is sufficient. I think, too, that it together with the statistics which I shall put before you, will establish my two main points: First, that Cæsarean section should be avoided whenever possible, on account both of its immediate risk and of its possibly crippling effect on the

patient. Secondly, that Cæsarean section is seldom necessary, because the art of midwifery provides a more satisfactory alternative.

The mortality following Cæsarean section varies directly according to the stage at which the operation is done. The figures collected by Holland in 1921 prove this very clearly. Cæsarean section for contracted pelvis done before labour begins caused a mortality of 1·4%; early in labour a mortality of 1·8%; late in labour a mortality of 10%; after a preliminary induction of labour a mortality of 14%; after attempted forceps a mortality of 25·7%; after attempted craniotomy a mortality of 50%. I wish to emphasize the fact that, even when the operation was done under the most favourable circumstances, the mortality was 1·4%.

This is a low mortality, lower perhaps than is actually the case. Williams's corrected statistics for all cases in his hospital, corrected by the exclusion of deaths which were not attributable to the operation, give a mortality of 3·35%. He divides his cases into two periods. In the first period he operated at any time during labour, often after a prolonged second stage. The mortality was 12%. In the second period the operation whenever possible was done before or a few hours after the onset of labour. The mortality was 2·45%. Further, he considers that the general mortality in the United States of all women in labour is 10%.

The cost of Cæsarean section done late in labour is very high. As Williams says the evidence is clear that whenever a considerable time has elapsed between the onset of labour and the performance of Cæsarean section, we must take into consideration the probable existence of a latent infection which may later give rise to a general peritonitis. To prevent this there is apparently only one remedy and that is to substitute a radical for a conservative operation and to remove the uterus. Such a course reduces the mortality very markedly. Williams records fifty-six cases with a mortality of 1·8%. It is, however, a high price for a young woman to have to pay.

Perhaps if it were possible to get into the mind of the operator who unnecessarily resorts to Cæsarean section late in the second stage, that his duty is to remove the uterus as well as the infant, it might induce him to try obstetrical methods of delivery before resorting to surgical ones.

I think we may take it as a fact that every case in which an unforeseen Cæsarean section has to be done for obstructed labour, is directly due to a failure of diagnosis, that is in the great majority of cases to insufficient or inefficient antenatal care. I do not mean to suggest that diagnosis is always possible. Theoretically it may be. Practically it may not. I think, however, that if you examine the causes of obstruction that cannot be recognized before or at the beginning of labour, you will find that the correct treatment for most of them is not Cæsarean section. Antenatal care and diagnosis is one of the surest ways of avoiding unnecessary operations, of enabling us to do the necessary ones at the proper time and so of reducing the mortality to a fifth of what it would otherwise have been.

I am quite aware that it is customary in many places to practise in contracted pelvis what is called the test of labour and, if delivery fails, to perform a Cæsarean section late in labour. I cannot give a general approval to such a course. In the first place careful examination and internal measurement with Skutsch's pelvimeter will usually enable us to decide whether Cæsarean section is the proper course to adopt, while, if there is a reasonable prospect that the patient will deliver herself and she fails to do so, pubiotomy is preferable, especially in *multiparæ*. There are undoubtedly border-line cases in which an exact prognosis is impossible and in such the obstetrician who attends them, must decide according to his own views. I would like, however, emphatically to protest against the idea that a test labour can be substituted for exact preliminary diagnosis, because the object of the latter is to exclude as far as is possible the necessity for the former. I shall not go further into the matter as it is to be brought before the meeting later.

The risks of Cæsarean section do not end with the convalescence of the patient, because there is in all cases the danger that a permanent injury may result to the uterine wall, which is thereby thinned and prone to tear during a subsequent labour. Theoretically, it should be possible to produce a union of the incision which after a short time is indistinguishable in appearance or strength from the rest of the muscle. Practically, there is always the risk that unsuitable suture material, bad suturing or sepsis of the wound may cause a weakening of the scar. That the risk is a real one is shown by Holland's collected statistics. Seventy women were delivered or delivered themselves through the vagina after a previous Cæsarean section and in eighteen or about 23% the scar ruptured during labour. Rupture during pregnancy is rarer, but it, too, may occur.

Again, peritoneal adhesions, while they are not necessarily dangerous to life and may be symptomless, are not an advantage. Williams, in forty-eight women who had been operated on in his own clinic, found subsequent "broad or dense adhesions" in a third. In others who had been operated on elsewhere, he found them still more frequently.

Accordingly a young woman on whom Cæsarean section is done, may be left in such a state that she is unable to have a normal labour subsequently; she may be rendered permanently sterile by the loss of her uterus or she may lose her life from the risks inseparable from the operation. The obvious conclusion from these facts is that Cæsarean section must be avoided whenever it is possible to do so.

What are the conditions in the treatment of which Cæsarean section is most abused? The three most common are probably the milder degrees of contracted pelvis, eclampsia and *placenta prævia*.

The milder degrees of contracted pelvis offer perhaps the largest field for the irresponsible operator. As Williams puts it: "I have been reluctantly forced to the conclusion that, in many parts of the country, the mere diagnosis of a con-

tracted pelvis, irrespective of degree, is considered a satisfactory indication for the operation."

There are usually considered to be four degrees of contracted pelvis. In flat pelves whose true conjugate measures 8·25 centimetres (3·25 inches) or more, there is very seldom an indication for operation. When the conjugate measures between 8·25 and 7·0 centimetres (3¼ to 2¾ inches), Cæsarean section is permissible, but can be replaced by the induction of premature labour or by pubiotomy. In the other two degrees, Cæsarean section is positively indicated. The vast majority of contracted pelves fall into the first or the upper limit of the second degree; Williams places it at about 95% and of these 80% deliver themselves spontaneously. The selection of the correct line of treatment is entirely a matter of exact diagnosis, as made by internal and external measurement of the pelvis and by estimating the relation of the fœtal head to the pelvic brim. External measurement alone is valueless. A general practitioner who had not had a very large midwifery experience, is most unwise to undertake the management of such cases and the routine performance of Cæsarean section does not lessen his responsibility.

To the obstetrician whose experience entitles him to treat such cases, I should like to say: "Learn how to use Skutsch's pelvimeter. There is no mystery about it. The ordinary mechanic learns to use measuring instruments which are much more difficult to handle. You can learn its use on the dummy almost as well as on the patient. It is usually necessary to give an anæsthetic, but the number of women who must be measured internally, is very small. If it was a question of an ordinary gynæcological examination, you would not hesitate to give an anæsthetic if necessary. Why should you hesitate when the welfare and perhaps the life of both mother and child are at stake? It is necessary to exhaust all the powers of diagnosis before you advise your patient that a Cæsarean section is unavoidable."

Eclampsia is probably the next most common cause of the abuse of Cæsarean section and that, too, in spite of the fact that its results prove it to be almost the most fatal line of treatment. I pointed this out at the Christchurch meeting of the New Zealand Medical Association in 1923. A short time afterwards I met a medical practitioner who has a large obstetrical practice. He told me that he and a friend had listened to what I had said at the meeting and that—I think his words were—they had never laughed so much before. I suggested that it was unkind of him to have laughed at me. He replied: "We did not laugh at you. We laughed at the idea of anyone doing anything but Cæsarean section for eclampsia."

Let us see what it was he actually was laughing at.

Eden in 1922 published an exhaustive analysis of the results of eclampsia as treated in Great Britain and Ireland. One of his conclusions was that both in mild and in severe cases Cæsarean section and *accouchement forcé* were followed by the highest mortality—a mortality which Holland found to amount to 32% after Cæsarean section.

Petersen found that in the United States the mortality of eclampsia radically treated was 34·8% and Williams at Baltimore prior to 1916 treated by radical measures eighty-five cases with a mortality of 24·7%.

In Germany Engelmann reported a mortality of 26% and Lichtenstein a mortality of 16·7%.

The results of conservative treatment, on the other hand, are given as follows: Williams was able to report a mortality of 13%, Engelmann of 6% and Lichtenstein of 9·4% after they had changed round to conservative treatment. Fitzgibbon and Solomons reported 204 cases with a mortality of 10·3%. Windeyer at Sydney treated 158 patients with a mortality of 6·9%. Stroganoff collected 3,302 cases treated by his method with a mortality of 10·4%, while in more than 230 cases which he treated personally, the mortality was 2·5%. Incidentally, I may say that he stated that the mortality in New Zealand was 25%, but I do not know where he got his figures. The statistics which I am just about to quote, show a mortality of 22·9%.

What my friend laughed at then seems to have been methods of treating eclampsia which reduced a mortality of between 16·7% and 34% to one of between 2% and 13%. Even in his own country of New Zealand facts are against him. I have recently analysed the results of 149 cases of eclampsia reported by different medical practitioners. Conservative treatment in 104 cases gave a mortality of 15·38%; Cæsarean section in twenty-nine cases of 27·5% and *accouchement forcé* and allied procedures in sixteen cases of 43·7%. I have no reason to think that the cases treated by Cæsarean section were any more serious than those treated conservatively.

It is generally recognized that there is a place for Cæsarean section in the treatment of eclampsia, but that it is a very small one; practically speaking it is only to be found amongst the cases in which conservative treatment has failed to bring about any improvement.

Placenta prævia comes next and here, too, the results obtained from Cæsarean section, as compared with those of more conservative measures, are directly opposed to its routine use. Holland reported that the mortality in the British Isles after Cæsarean section in 139 cases was 11·5%. R. W. Holmes estimated that the similar mortality in the United States was 20%. On the other hand, purely obstetrical treatment has given the following results. Williams, who uses the Champetier de Ribes's bag, had one death in forty cases, or 2·5%. Hofmeir, Behm, Lomer, Essen-Möller, Pinard and Stratz have recorded a total of 603 cases treated by Braxton Hicks's method with a mortality of 2·9%. I recorded a short time ago 264 cases which had occurred at the Rotunda Hospital with a mortality of 5·3%. I am able to say that a number of the patients who died, were moribund on admission and could not have been treated by Cæsarean section.

If these cases are excluded, as they should be in any comparison with the results of Cæsarean section, the mortality would have been about 3%.

Unless we are prepared to accept obstetrical incompetence as a valid indication for Cæsarean section, the only justification for it in *placenta prævia* is that it will save more infants. As Holmes says in the United States operation saved one baby for every mother it killed. I do not think that in *ante-partum* hæmorrhages the prospect of life possessed by a premature infant, weakened by maternal and often by fœtal hæmorrhage, is sufficiently valuable to place in competition with the life of the mother.

There is a place for Cæsarean section in the treatment of *placenta prævia* just as there is in treatment of eclampsia, but it is a very tiny one.

Perhaps I had better define it, as I have recently been wrongly quoted as saying there is no place for it. A fœtus that is viable and that has not been weakened by previous bleeding, a mother who is in good condition and a placenta which is central, give, I think, a good reason for doing Cæsarean section in order to save the fœtus.

There are still a few conditions left which serve as reasons or excuses for Cæsarean section. Malpresentation of the fœtus is one of them. I think that since I was qualified I have known personally of two cases in which Cæsarean section was done for transverse presentation. In one the mother died, in the other both mother and child lived. The former was catastrophic, the latter peculiar. In the morning an hour and a half after the rupture of the membranes, the medical attendant found a transverse presentation by external examination. He did nothing. In the evening he found the cord and a hand in the cervix by internal examination. He gave the patient morphine. The next morning, as meconium was coming away, he did a Cæsarean section. The patient was twenty-four and had had two normal confinements. His reason for his treatment was that the uterus was throughout in a state of tonic contraction, but the fact that the child was alive and well twenty-four hours after the membranes ruptured is rather opposed to this. No attempt was made to see if the contraction would pass off under an anæsthetic or to correct the presentation by internal version.

I would like to make the following suggestions: First that almost every case of neglected shoulder presentation in which the child is alive, can be changed to a foot presentation by internal version. Secondly, that if the presentation cannot be changed, the amount of force required to bring the fœtus out of the pelvis during a Cæsarean section must be so great as to be injurious to the uterus. Thirdly, that the patient in such a case would almost invariably be infected and that consequently a hysterectomy is always necessary. Fourthly, that when the child is dead, there is no possible indication for Cæsarean section.

I have the records of 209 cases of transverse presentation treated in the Rotunda Hospital. I do not think that decapitation has ever been done on a living child nor has delivery ever been effected by Cæsarean section. In other words in every such case it has been possible to correct the presentation.

I am, of course, excluding cases in which operation may be necessary, not on account of the presentation, but because the pelvis is contracted or other form of gross obstruction exists.

I said that there was a tiny place for Cæsarean section in the treatment of *placenta prævia*. I do not think there is even this place for it in the treatment of transverse presentation.

Time will not allow me to discuss the other forms of obstructed labour that have been used as a reason or an excuse for Cæsarean section. There are undoubtedly several forms in which the operation may be necessary and amongst them I am afraid that rigidity of the cervix is sometimes included. I had thought that this ancient bugbear of the obstetrician had passed away with the midwife who kept her fingers in the vagina throughout labour. Still, should a *bona fide* instance of it occur, I am inclined to think that it should be possible to remove it by obstetrical measures, instead of removing the child by surgical ones.

It is possible that some of my audience might like to hear statistics showing results obtained at maternity hospitals by those who cultivate the art of manufacturing obstetrical operations. Here are a few:

At the Bellevue and Associated Hospital in New York, 4,268 patients were confined. Cæsarean section was done once in ninety-seven cases. The death rate from eclampsia was 48% and after Cæsarean section 7%. The total death rate was 25 per 1,000.

At the Boston Lying-in Hospital, 1,133 patients were confined. An obstetrical operation was performed once in every 2·4 cases and Cæsarean section was done in every twelve cases. The death rate from eclampsia was 54% and the total death rate was 22 per 1,000.

At the Jefferson Hospital in Philadelphia, 1,453 patients were confined. Cæsarean section was done once in every 6·3 cases and the total death rate was 23 per 1,000.

May I contrast with these the similar statistics of the Rotunda Hospital for thirty-four years ending 1922. There were 57,412 confinements. Cæsarean section was done once in every 366 cases. The death rate from eclampsia was 12·5% and the total death rate was just under 5 per 1,000.

Is it any wonder that Williams speaks of "an abuse of the operation (Cæsarean section) which can be attributed only to an obsession by the *furor operativus*"?

I do not think that anyone can dispute the accuracy of the statistics I have given. Assuming that they are correct, is it possible for anyone to advise the operation for conditions that can be equally well or even better cured by obstetrical measures? Further, can anyone fail to recognize the necessity for such careful antenatal examination of the patient as will enable us to operate under the most favourable circumstances whenever

Cæsarean section is really necessary?

There is a glamour which attaches itself to the operation of Cæsarean section in the minds of the public and a kind of spurious fame, more rightly called notoriety, that surrounds the operator and that can cause a sympathetic reaction in his mind. Some of us may remember old descriptions of operative scenes in which a self-conscious operator extracted a baby through a uterine incision, much as a conjuror extracts a rabbit from a top hat, while his class wildly applauded. This kind of thing has passed away, but in small communities the glamour and the spurious fame still remain, to the detriment of the bodies of patients and the minds of their medical advisers. I am sure there is no need here to warn against any attempts to encourage such absurdity, but perhaps it is well to suggest the wisdom of definite efforts to kill it. I know no better way of so doing than by medical men bringing their patients to recognize that, as I have said before, practically every case in which an unforeseen Cæsarean section due to obstructed labour is necessary, is directly due—at any rate theoretically—to insufficient or inefficient antenatal care. Moreover, I am quite sure that, whether with or without medical guidance, the public will some day recognize the fact for themselves. It is entirely preferable, when this happens, that the medical profession should be able to say: "We told you so."

I have written a little strongly on the subject that has been allotted to me, but I think you will see that every opinion I have expressed is shared by obstetricians of the highest rank. I think, too, that many of you will agree with me that there is a real danger of obstetrics becoming a lost art. R. W. Holmes foresaw this danger ten years ago and I do not know that it has got any less since. There are several ways of combating it, but this is not the time to discuss them. It is, however, a good time to remember that the conscientious medical adviser cannot justify himself when he tries to replace a lack of obstetrical knowledge by mere surgical facility.

The desire to do Cæsarean section unnecessarily is a disease begot by *furor operandi* out of obstetrical ignorance, just as malaria is begot by the Anopheles out of stagnant water. It is a question if it should not be a notifiable disease with the definite object of preventing its spread. I dislike very much bureacratic interference with the liberty of the individual unless it is unavoidable, but voluntary cooperation would be most welcome. I think that if medical practitioners generally would furnish the Health Department with information regarding cases in which they found Cæsarean section necessary, they would materially help to check any abuse of the operation and so to reduce maternal mortality and I commend my suggestion to the kind consideration of the Congress. Further, I think that the newly formed Obstetrical Society of New Zealand has here ready to its hand a task worthy of its best efforts, namely to ascertain and to analyse the conditions under which Cæsarean section is done in New Zealand, and its consequences immediate or remote.

Finally, I should like to summarize briefly the conclusions which I think must be drawn from the facts I have put before you.

1. Cæsarean section done under the most favourable conditions is associated with a mortality of nearly 2% and may be followed by peritoneal adhesions and subsequent rupture of the scar.

2. Cæsarean section done under unfavourable conditions is followed by a mortality of from 10% to 50% and in patients who survive the risk of after complications, is greater.

3. The only way of avoiding such operations is careful antenatal diagnosis and the only way of reducing their mortality when they are necessary, is to remove the uterus.

4. Unless there is good reason for thinking that the uterine incision has healed satisfactorily, it may be unwise to allow a patient to deliver herself at subsequent pregnancies.

5. The treatment of eclampsia by Cæsarean section is followed by a mortality of from 16% to 34%. Conservative treatment is followed by a far lower mortality.

6. The treatment of *placenta prævia* by Cæsarean section is followed by a mortality of from 11% to 20%. Obstetrical treatment is followed by a far lower mortality.

7. The necessity for treating a transverse presentation by Cæsarean section is almost unknown. When it occurs, it is also necessary to remove the uterus.

8. The statistics of hospitals in which Cæsarean section is extensively done, unless they are based on a foundation quite distinct from that of other maternity hospitals, do not offer any encouragement to those who would imitate their producers.

Perhaps it would be wise to disarm criticism by admitting at once that my paper has not got a single new idea in it nor any promise or even suggestion of a new idea to come. It is more or less a plea for reversion—reversion to the older and saner ideas that used to govern midwifery practice generally and that still govern it in most places. If the truth lies in front of us, it is well to go forward, but if we have overshot her and she is behind us, it is necessary to turn back. Discretion is the better part—of midwifery.

Summary of Statistics.

The Mortality of Cæsarean Section for Contracted Pelvis (Holland).

Operation done before labour, mortality	1·4%
Operation done early in labour, mortality	1·8%
Operation done late in labour, mortality	10%
Operation done after a preliminary induction ..	14%
Operation done after attempted forceps	25·7%
Operation done after craniotomy	50%
Average mortality in British Isles	4·3%

The Mortality of Cæsarean Section, Including All Cases (Williams).

Operation done at any time in labour	12%
Operation done before or at the onset of labour	2·45%
Average personal mortality	3·35%
Average general American mortality (estimated)	10%

Rupture of the Uterine Scar After Previous Cæsarean Section (Holland).

70 operations; 18 ruptures .. .. 23% approximately.

Mortality Following Cæsarean Section for Eclampsia.

Reporter.	Number of Cases.	Percentage Mortality.
Holland (British Isles)	—	32
Petersen (America)	—	34·8
Williams	85	24·7
Engelmann	—	26
Lichtenstein	—	16·7

Mortality Following Conservative Treatment of Eclampsia.

Reporter.	Number of Cases.	Percentage Mortality.
Williams	92	13
Engelmann	—	6
Lichtenstein	—	9·4
Fitzgibbons and Solomons (Rotunda Hospital)	204	10·3
Windeyer	158	6·7
Stroganoff, collected	3,302	10·4
Stroganoff, personal	230	2·4

Mortality Following Eclampsia in New Zealand.

Number of Cases.	Treatment Adopted.	Deaths.	Percentage Deaths.
104	Conservative	16	15·38
29	Cæsarean section	8	27·5
16	*Accouchement forcé* and allied proceedings	7	43·7

Percentage mortality of conservative treatment 15·38%
Percentage mortality of radical treatment .. 33·3%

Mortality Following Cæsarean Section for Placenta Prævia.

Reporter.	Number of Cases.	Percentage Mortality.
Holland (British Isles)	139	11·5
R. W. Holmes (America)	—	20

Mortality Following Conservative Treatment of Placenta Prævia.

Reporter.	Number of Cases.	Percentage Mortality.
Williams	140	2·5
Various French and German Writers	603	2·9
Jellett (Rotunda Hospital)	264	5·3

Bibliography.

1. J. W. Williams: "Obstetrics," 1924.
2. J. W. Williams: "The Abuse of Cæsarean Section," *Surgery, Gynecology and Obstetrics*, 1917, Volume XXV., page 194.
3. J. W. Williams: *Transactions of the American Gynecological Society*, 1901, Volume XXVI., page 260.
4. J. W. Williams: "A Critical Analysis of Twenty-one Year's Experience with Cæsarean Section," *Bulletin of the Johns Hopkins Hospital*, 1921, Volume XXXII., page 173.
5. R. W. Holmes: "Obstetrics, a Lost Art: A Criticism of the Promiscuous Indications for Cæsarean Section," *Surgery, Gynecology and Obstetrics*, 1915, Volume XXI., page 636.
6. E. Holland: "The Result of a Collective Investigation into Cæsarean Sections Performed in Great Britain and Ireland from the Year 1911 to 1920 Inclusive," *Journal of Obstetrics and Gynæcology of the British Empire*, 1921, Volume XXVIII., page 358.
7. E. Holland, J. M. M. Kerr (and others): "Discussion on Rupture of the Cæsarean Section Scar in Subsequent Pregnancy or Labour," *Proceedings of the Royal Society of Medicine* (Section of Gynæcology and Obstetrics), 1920-21, Volume XIV., page 22.
8. T. W. Eden: "Eclampsia: A Commentary on the Reports Presented to the British Congress of Obstetrics and Gynæcology, June 29, 1922," *Journal of Obstetrics and Gynæcology of the British Empire*, 1922, Volume XXIX., page 386.
9. F. Engelmann: *Zentralblatt für Gynäkologie*, 1911, *Band* LXVIII., *Seite* 640.
10. F. Engelmann: *Hat die Einhaltung der mittleren Linie bei der Behandlung der Eklampsie noch Berechtigung? Zugleich ein Wort zur Bestimmung des Begriffs Eklampsie.*" *Zentralblatt für Gynäkologie*, 1920, *Band* XLIV., *Seite* 1113.
11. Stroganoff: "My Improved Method of the Prophylactic Treatment of Eclampsia," *Journal of Obstetrics and Gynæcology of the British Empire*, 1923, Volume XXX., page 1.
12. B. Solomons: "The Treatment of Eclampsia by the Dublin Method," *Journal of Obstetrics and Gynæcology of the British Empire*, 1922, Volume XXIX., page 416.
13. Henry Jellett: "The Place of Cæsarean Section in the Treatment of Placenta Prævia," *The Lancet*, May 7, 1910, page 1271.
14. Henry Jellett: "Treatment of *Placenta Prævia*," *The New Zealand Medical Journal*, June 10, 1925, page 167.
15. R. E. Tottenham: "Some Observations on the Maternal Mortality of the U.S.A.," *Irish Journal of Medical Science*, November, 1925, page 516.
16. J. C. Windeyer: "The Toxæmias of Pregnancy with an Analysis of 158 Cases of Eclampsia"; Transactions of the First Session of the Australasian Medical Congress (British Medical Association), Supplement to THE MEDICAL JOURNAL OF AUSTRALIA, April 5, 1924, page 179.

PROFESSOR J. C. WINDEYER (Sydney) said that Dr. Jellett had emphasized the middle course in obstetrics, the art of obstetrics. Cæsarean section had been overdone everywhere, not so much in Australia as in America, where some results were disastrous. Statistics showed that in some hospitals one out of every five had died following Cæsarean section, the result of ill-advised use of the

GENERAL STATISTICS.

Hospital.	Number of Deliveries.	Proportion of Operations.	Percentage Mortality.		
			Cæsarean Section.	Eclampsia.	Total.
Jefferson, Philadelphia (1921-1924)	1,453	—	—	—	2·3
Boston Lying-in (1924 ?)	1,133	1 in 2·4	7·6	54	2·2
Bellevue, New York (1922)	4,286	—	7	48	2·5
Rotunda Hospital, Dublin (1889-1922)	57,412	1 in 14·5*	—	12·5	0·49

* Induction of labour, manual removal of placenta, forceps, version, Cæsarean section, symphysiotomy, pubiotomy, craniotomy, decapitation.

operation. He would discuss contracted pelvis later on in the afternoon.

He had not performed the operation for eclampsia. In a very few cases it might be necessary to undertake the operation, but all were agreed that conservative treatment was the ideal method. He was very pleased to see the excellent results of the Rotunda treatment. He considered that to obtain beneficial statistics Cæsarean section should be notifiable.

In the Royal Hospital for Women, in Sydney, during the years 1920 to 1925 inclusive there had been 11,266 confinements. Cæsarean section had been performed one hundred and twelve times (1%). This corresponded with the Melbourne figures. The total mortality was twelve deaths among the one hundred and twelve patients. Of the operations 66·9% were operations for contracted pelves with a mortality rate of 7·1%. There were a few cases of accidental hæmorrhage and still fewer cases of the toxæmias and obstruction due to fibroids. Among the remaining forty-two patients the mortality rate was 6·6%.

DR. R. MARSHALL ALLAN (Melbourne) presented a table giving the details of Cæsarean sections performed by private practitioners in Victoria. He had met the practitioners personally and had obtained from them confidential statistics of their obstetric practice. In Victoria the actual incidence varied from 0·1% to 2% and this represented the work of not more than 30% of the doctors interviewed. Melbourne and its suburbs provided 80%, the country towns the remaining 20%. He had found that different suburbs and even different streets varied considerably. In one street one practitioner had not performed the operation, whilst another living near had performed Cæsarean section ten times among a total of six hundred maternity patients. In the vast majority the operation was done by men who had had no special obstetric training and often these operations were performed in small ill-equipped private hospitals. He considered that they should return to the older methods of conservative delivery. He hoped that in future he would be able to obtain statistics from obstetrical societies rather than from Government departments. They should try to keep to uniform methods in obstetrics; statistics of private practitioners should be forwarded regularly, Cæsarean section should not be performed without a consultation; they would then find that their results would be uniformly better. Patients and relatives were to be blamed for much of the hurry-up tactics in obstetrics.

DR. F. R. RILEY (Dunedin) expressed agreement with the previous speaker. He spoke of the conditions obtaining on a few occasions when it had been necessary for him to perform the operation. He considered that the indications were: (i.) contracted pelvis, (ii.) eclampsia, particularly in a *primipara* with an undilated *os* when conservative methods had failed to produce improvement, (iii.) accidental hæmorrhage (in the case of central *placenta prævia* Cæsarean section was sound treatment), (iv.) in elderly *primiparæ*, especially after reposition efforts had failed in a breech presentation.

DR. P. G. BRETT (Melbourne) thanked the speakers for their instructive papers. In cases of tumours obstructing labour it was not always necessary to perform Cæsarean section. Occasionally the tumour could be removed and the pregnancy allowed to go on naturally. He quoted a case of a large ovarian cyst obstructing labour. The cyst had been dealt with by abdominal section. A live child had been delivered with forceps and the patient had a smooth convalescence without any complications. Later she had had another child normally. He also quoted a case of pelvic hydatids. The cyst had been punctured through the posterior fornix and the child delivered. Pus had drained through the colpotomy wound for some time

CÆSAREAN SECTION.—INDICATIONS AND RESULTS OBTAINED FROM VICTORIAN PRACTITIONERS.

Indications.	Number of Cases.	Parity.		Maternal Results.			Fœtal Results.		
		Primiparæ.	*Multiparæ.*	Alive.	Died.	Mortality Rate.	Alive.	Died.	Mortality Rate.
Contracted Pelvis	110	92	18	106	4	3·6	105	5	4·5
Placenta Prævia	35	11	24	33	2	5·7	34	1	2·8
Eclampsia	21	19	2	18	3	14·2	16	5	23·8
Toxæmia	11	10	1	5	6	54·5	4	7	63·5
Fibroids	7	6	1	6	1	14·2	6	1	14·2
Accidental Hæmorrhage	5	1	4	4	1	20	2	3	60
Rigid Cervix	5	4	1	5	—	—	5	—	—
Ovarian Cyst	4	1	3	3	1	25	4	—	—
Abdominal Adhesions	2	1	1	1	1	50	1	1	50
Congenital Malformation of the Vagina	2	1	1	2	—	—	2	—	—
Fœtal Ascites	2	—	2	2	—	—	—	2	100
Breech	1	1	—	1	—	—	1	—	—
Impacted Shoulders	1	1	—	1	—	—	—	1	100
Locked Twins	1	1	—	1	—	—	2	—	—
Asthma, Bronchitis	1	1	—	1	—	—	1	—	—
Diphtheria	1	—	1	—	1	100	—	1	100
Cardiac Disease	1	1	—	—	1	100	—	1	100
Total	211	152	59	190	21	9·9	184	28	13·2

COMMENTS.

The operation for contracted pelvis was the classical Cæsarean section in all cases. No details of the pelvic measurements are available. Repeated Cæsarean section was required seven times. Trial labours were employed twenty-six times. Cæsarean section followed failure to deliver with forceps three times; two of the infants were still-born. The maternal death was due to sepsis twice, to shock and to ileus. In the majority of the patients there was a morbid condition during the puerperium. Three of the infants died shortly after birth.

Of the women with central *placenta prævia* eight were *primiparæ* and seventeen *multiparæ*. Two of them died (11·7%). Of the women with lateral or marginal *placenta prævia* three were *primiparæ* and seven *multiparæ*. There were no deaths.

All the women with eclampsia who died, were *primiparæ*. The majority of the cases were mild.

In the majority of the patients with toxæmia the condition was severe; many of them were moribund before operation.

Cæsarean hysterectomy was performed in six of the patients with fibroids.

All the deaths from accidental hæmorrhage were of *multiparæ*. The hæmorrhage was severe in but a few. In the majority it was external.

In the series of rigid cervix there were two *primiparæ* who had been in labour for thirty-six hours; one *primipara* who had been in labour for less than twelve hours, one *primipara* aged forty-four years, who had been in labour only a short time and one woman with cicatrices following a cervical operation for previous birth trauma.

The woman who died of an ovarian cyst had sarcoma; death was due to embolism.

In the class of abdominal adhesions one woman died of rupture of the uterus following prolonged labour.

Both operations for congenital malformation of the vagina were on the same patient.

The presentation in the class listed as fœtal ascites was by breech in both; the *os* was fully dilated. The operator considered that delivery *per vaginam* was impossible.

Cæsarean section was performed for breech presentation in a *primipara* aged forty-three years.

The patient with asthma and bronchitis was a *primipara* aged thirty-five.

The patient with diphtheria was moribund; the operation was performed to save the child.

The patient with cardiac disease collapsed during labour.

and no rise of temperature occurred. The question of the postmature child was a difficult one; if possible, the pregnancy should not be allowed to go over time.

DR. C. NORTH (Dunedin) considered that vaginal hysterotomy had its place in a discussion on Cæsarean section. He quoted two successful cases. He thought that the operation was neglected largely on account of the fear of damage to the bladder. He had never found any difficulty. He agreed with the suggestion of notification of Cæsarean section.

DR. LENNOX SPIERS (Victoria) asked what should be done if a patient with eclampsia failed to respond to conservative treatment.

DR. J. P. S. JAMIESON (Nelson) referred to induction of labour and asked whether stimulation of the uterus might not result in cerebral hæmorrhage in the infant.

DR. E. H. SIEDEBERG (Dunedin) pleaded for antenatal supervision from the early months of pregnancy. With proper antenatal care Cæsarean section for eclampsia should be almost unknown.

DR. P. L. HIPSLEY (Sydney) said that in cases of antenatal hæmorrhage necessitating Cæsarean section, transfusion saved the patient from death due to hæmorrhage. He thought that if notification of Cæsarean section were compulsory, practitioners might avoid recourse to it even when the operation was necessary.

Dr. Henry Jellett in reply said that in *placenta prævia* in addition to the gross mortality (10%) the crippling after effects, sterility and a weakened uterus, had to be taken into account. Central *placenta prævia* was not an indication for the performance of Cæsarean section in the interests of the mother, but in those of the child. He could not agree with Dr. Riley that it was an indication for the operation.

In mild degrees of contracted pelvis the treatment should not be undertaken by the general practitioner. Pubiotomy generally met the case. External measurements were of value only to show whether internal pelvimetry was necessary or not. They should never be allowed to influence the final decision. Vaginal hysterotomy certainly was an excellent operation. He emphasized again the necessity of an examination under chloroform when the obstetrician was in doubt.

DR. A. M. WILSON said that he was emphatic about performing Cæsarean section in the case of "the third child." In eclampsia indications for Cæsarean section were much more definite. Conservative treatment, if carried out thoroughly, with attention to every detail, was the ideal method. When inducing labour he used quinine and castor oil only. He did not advocate quinine in *primiparæ*. He did not use bougies. In concealed accidental hæmorrhage transfusion was his routine practice.

SECTION IV.—PATHOLOGY AND BACTERIOLOGY.

ASCENDING RENAL INFECTION.

By C. H. KELLAWAY, M.C., M.D., M.S., M.R.C.P. (London); C. J. O. BROWN, M.D. (Melbourne), F.R.C.S. (England)

AND

F. ELEANOR WILLIAMS.

(*From the Walter and Eliza Hall Institute, Melbourne*).

THE general trend of modern opinion is to regard nearly all renal infection as blood borne and in a number of cases the evidence does not admit of any other interpretation. When, however, the innervation of the bladder is deranged or when obstruction from mechanical causes occurs in the outflow from the bladder, it is possible that ascending infection may occur either by the lymphatics or through the lumen of the ureter.

The connexion between the lymphatics of the kidney and bladder through the lymphatics of the ureter has been demonstrated by Sakata (1903), but much of the evidence in favour of spread along these channels is inadequately controlled in regard to the possibility of blood infection. Stewart (1910) and Sweet and Stewart (1914), for example, in experiments with dogs found that if the ureter were implanted into the bowel, the course of the infection which resulted, could be traced in periureteral areas of necrosis and purulent infiltration. They were able to implant the ureter into the bowel without causing infection of the corresponding kidney by passing it in through the pancreatic duct. Obstruction of the ureter at the point of entry into the bowel was only avoided in their negative experiments and in their positive experiments obstruction may have determined localization from the blood stream. The experiments of Eisendrath and Schultz (1916) which favour ascending infection by the lumen of the ureter in cases of obstruction and by the lymphatics in simple infection of the bladder, were controlled only by blood cultures taken at autopsy. The experiments of Walker (1913) and those of Thiele and Embleton (1913) seem to demonstrate the possibility of lymphatic ascent in the guinea pig in the absence of obstruction or any other interference with normal micturition, though in some experiments which I cannot for reasons of space place before you in the present paper, we were not able to obtain similar results.

Ascent along the lumen of the ureter is normally opposed by the steady downward flow of urine and by the arrangement of the bladder musculature round the ureteral orifice. A large number of workers have unsuccesssfully sought to produce this type of infection. Draper and Braasch (1913) failed to cause infection of the kidneys of dogs in which the uretero-vesical valve had been slit, nor could they obtain regurgitation from the bladder even when considerable pressures were used. The work of earlier experimenters was not adequately controlled by blood cultures, though there are some observations which cannot be dismissed upon these grounds. Guyon and Albarran (1890) injected charcoal into the bladders of dogs and rabbits and with complete retention found particles of charcoal in the pelvis after forty-eight hours, though only in minute quantities. They showed also that in obstruction the composition of the bladder urine was very different from that found in the renal pelvis, that secretion by the kidney gradually fell off during the early hours of obstruction and the bladder and ureter ceased to contract. They held that since forty-eight hours was necessary for the ascent, antiperistalsis was not likely to explain the phenomenon, but that light particles might float from the bladder into the ureter and be carried by eddies or to and fro currents in the very slowly descending stream of urine. Lewin and Lewin and Goldschmidt (1893) injected milk, coloured fluids and gases into the bladders of rabbits and claimed to have observed regurgitation from the bladder into the pelvis of the kidney when the urethra was obstructed.

(*To be continued.*)

Wholly Set Up, Published and Printed at The Printing House, Seamer Street, Glebe, Sydney, N.S.W., by HENRY WILLIAM ARMIT, of The Point Road, Woolwich, Sydney, on behalf of THE AUSTRALASIAN MEDICAL PUBLISHING COMPANY, LIMITED, of 30-34, Elizabeth Street, Sydney.